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FINANCIAL COMMISSIONER, PUNJAB.

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18[illegible]

PREFACE.

PROPOSALS have been made to re-enact Act VIII of 1873 for the Punjab in a modified form. The following selection of papers is therefore published in the hope that it may prove useful to Divisional and District officers, should opinions be called for hereafter upon the projected legislature.

The papers now reprinted are disposed in four sections. The first of these consists of a collection of rules and departmental orders chiefly useful for reference. The second section contains a selection of papers intended to give some account of the difficulties connected with some features in the Owner's Rate system and of the reasons which led to the decision to dispense with Owner's Rate on the Sirhind Canal. The third section deals with Inundation Canals, and the fourth contains some recent papers on the irrigating duty of water, and the Bombay Canal Act.

The following table, showing what a large portion of the summer discharge of the Punjab rivers still remains unutilised, is interesting as showing the wide field still remaining for Canal extension in the province. The entries in the table have been roughly calculated by the Irrigation Department. The average duty and revenue of a cubic foot of water entering the canal on each of the Punjab Canal systems was in 1884-85 reckoned to be :—

Canal System.	Kharif.		Rabi.	
	Acres irrigated.	Revenue.	Acres irrigated.	Revenue.
		Rs.		Rs.
Western Jumna	94	287	81	131
Bári Doáb	47·6	146·4	115·1	250·9

Inundation Canals.	Whole Year.	
	Acres irrigated.	Revenue.
		Rs.
Upper Sutlej	69	69
Lower Sutlej and Chenab (a) Sutlej	65·24	2
Lower Sutlej and Chenab (b) Chenab	62·7	2

Statement showing approximate hot weather average discharges of the Rivers and Canals in the Punjab.

River.	Existing Canals.	Average discharge, May to October. River. c. f. p. s.	Canal. c. f. p. s.	Balance unutilized. c. f. p. s.	Remarks.
	Cubic feet.				
Jumna	1,500 Eastern Jumna (Perennial)	...	...	...	N.-W. P.
	2,500 Western Jumna (Perennial) ...	20,000	5,500	14,500	
	1,500 Agra (Perennial)	...	...	...	N.-W. P.
Beas Sutlej	4,500 Sirhind—Perennial	...	...	...	
	3,000 Ferozepore (Dist.) (Inundation)	15,000	...	...	
	2,500 *Upper Sutlej* (Inundation)	20,000	16,000	19,006	
	3,000 Lower Sutlej (Inundation)				
	3,000 Baháwalpur (Inundation)	...	...	...	Baháwalpur State.
Ravi	3,500 Bári Doáb—Perennial; 1,000 Sidhnai—Inundation ...	10,000	4,500	5,500	
Chenab	1,800 Chenab (Inundation)	...	...	...	Chenab Canal not yet opened.
	3,000 Lower Chenab (Inundation)	30,000	5,500	24,500	
	700 Muzaffargarh (Inundation)				
Jhelum	2,500 Jhelum (Inundation)	...	...	...	Jhelum Canal project under preparation.
	1,000 Shahpur (Imperial, Provincial & Private) (Inundation)	15,000	3,500	11,500	
Indus	3,000 Muzaffargarh; 3,500 Indus (Inundation)	80,000	6,500	73,500	
	Total	190,000	41,500	148,500	cubic feet per second.

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FINANCIAL COMMISSIONER'S OFFICE, No. 34.

No. LXII.—PAPERS RELATING TO CANALS.

SECTION I.
GENERAL RULES.

A.

General Canal Rules issued by the Punjab Government.

In exercise of the powers conferred on him by Act VIII. of 1873, and with the approval of His Excellency the Governor-General in Council, the Hon'ble the Lieutenant-Governor is pleased to direct the publication of the following rules, and to declare them applicable to the undermentioned Canals:—

The Bári Doáb Canal and all its Branches.
The Western Jamna Canal and all its Branches.
The Upper Sutlej Inundation Canals.
The Lower Sutlej and Chenáb Inundation Canals.
The Indus Inundation Canals.
The Inundation Canals in Shahpur and Bannu Districts under the control of Government.

* RULES ISSUED UNDER ACT VIII OF 1873.
PART III.
On Construction and Maintenance of Works.

1. *Orders for construction of works.*—The order which a Divisional Canal Officer may issue under Section 18 shall be in writing, and shall be served on each person concerned, or his representative, as a civil process through the Deputy Commissioner. (Section 18.)

2. *Proceedings of Superintending Canal Officers on reference.*—The Superintending Canal Officer before confirming or modifying a decision passed by the Divisional Canal Officer, under Section 20, shall hear and record any objections made to such decision by the parties interested, or their representatives, to whom at least fourteen days' notice of the date and of the place at which Superintending Canal Officer will consider the Divisional Canal Officer's decision shall be given. (Section 20.)

3. *Proceedings of Deputy Commissioner.*—The notice, which the Deputy Commissioner is bound to give to the Canal Officer under Section 24, shall not be less than fourteen days. (Section 24.)

4. *Opening of new water-courses.*—Water shall not be admitted into any new water-courses until all works necessary for the passage across such water-course, of water-courses existing previous to its construction, and of the drainage intercepted by it, and for affording proper communications across it for the convenience of the neighbouring lands, are completed to the satisfaction of the Divisional Canal Officer. (Section 29.)

5. *Applications for water.* All application for water, or for the construction or improvement of water-courses, under Part III. of the Act, shall be in the form prescribed in Appendix No. I.

PART IV.
ON THE SUPPLY OF WATER.

6. *Limit of length of water-courses.*—Water shall not ordinarily be

* NOTE.—These rules have been modified and added to by Notifications No. 4233 I., dated 15th September 1879, and 3027 I., dated 11th August 1881. The amendments have been embodied.

Section 31. granted to lands where the length of the water-course from its head to its point of contact with the fields exceeds two miles.

7. *Apprehended wastage.*—Applications under Section 16 of the said Act shall not be granted where, in the opinion of the Divisional Canal Officer, loss from wastage is likely to occur. From this decision an appeal may be preferred to the Superintending Canal Officer. (Section 16.)

7 A.—Such applications shall not ordinarily be granted in respect of lands where the available supply of water in the Canal, distributary, or water-course is already fully utilized.

8. *Sanitary reasons.*—The Divisional Canal Officer shall not engage to grant water for the irrigation of any kharíf crops upon lands within one mile from the outermost houses of any town, if such irrigation be objected to by the Municipal Committee (or, if there be no Municipal Committee, by the Deputy Commissioner), and the objection is approved by the Superintending Canal Officer and the Commissioner of the Division. Should these officers differ in opinion, the question will be referred to Government in the Irrigation Department, whose decision shall be final. (Section 31.)

9. *Preparation of fields.*—A Divisional Canal Officer may withhold or postpone the issue of water to any cultivator, whose fields he may have ascertained by personal inspection (by himself, one of his Assistants, or the Canal Deputy Collector) to be unprepared for irrigation by division into *kiárís* or compartments, not greater in area than 36 feet by 36 feet, and by the addition of small water-channels, as is customary in irrigation from wells:— (Section 31.)

(*a*) When a field is irrigated which has not been so prepared, an additional charge may be imposed equal to half the amount of occupier's rate leviable on the field.

(*b*) Rice-fields and gardens are exempted from the operation of this rule.

(*c*) In each case the Divisional Canal Officer, the Sub-Divisional Canal Officer, or Canal Deputy Collector, must certify that he personally examined the field, and that it was not properly prepared for irrigation according to the terms of the rule.

(*d*) An appeal against the orders of the Divisional Canal Officer may be preferred to the Superintending Canal Officer.

9 A.—When a field is irrigated which has not been so prepared, an additional charge may be imposed, not exceeding half the amount of occupier's rate leviable upon the field.

10. *Filling of tanks for watering cattle.*—Tanks may be filled with canal water without charge and without reference to the area irrigated in any village, whenever water can be made available without injury to the cultivation dependent on any canal, under the following regulations:— (Section 31.)

(1) Except as provided in Rule 12 (*a*), no tank shall be so filled unless exclusively used for domestic purposes and for watering cattle; such tanks are generally in the immediate neighbourhood of villages.

(2) No tank shall be so filled, which intercepting any line of drainage, is liable to overflow from accumulation of water derived from natural causes.

(3) No tank shall be so filled except on the written order of the Sub-Divisional Canal Officer, issued on the written applications of the parties concerned. The filling of tanks can only be permitted at such times and to such extent as the Sub-Divisional Canal Officer approves.

(4) No tank shall be so filled unless the water-course used to fill it shall be shown to the satisfaction of the Sub-Divisional Officer, to be in a sound condition when the application is made.

(5) Except as provided in Rule 12 (*a*) every tank so filled shall be used exclusively for domestic purposes or for watering cattle; and in the event of any breach of the foregoing regulations by any person for whose benefit the tank has been so filled, or in the event of any such person using any tank so filled otherwise than for domestic purposes as for watering cattle, except as provided by Rule 12 (*a*), the privilege by this rule afforded may, in addition to any penalty which may be incurred under the Act, be suspended for 12 months by order of the Divisional Canal Officer passed on a regular proceeding and inquiry in each case; from his order an appeal may be preferred to the Superintending Canal Officer.

11. *Contracts.*—The Divisional Canal Officer, with the previous sanction of Superintending Canal Officer, is empowered to make contracts for the supply of canal water for purposes other than irrigation, not specified in schedule of rates, for any term not exceeding one year. For terms exceeding one year the previous sanction of the Local Government shall be necessary.

12. *Charges for water used for purposes other than irrigation.*—Tanks may be filled with canal water for purposes other than those stated in Clause I of Rule 12: such water will be charged for at rates and subject to conditions to be determined by the Local Government in each case.

12 A. Irrigation may also be carried on from tanks, *provided the previous* sanction of the Sub-Divisional Canal Officer be obtained. The usual rates will be charged for such irrigation.

13. *Water supplied to cantonments, towns, &c.*—When water is supplied to forts or other military buildings, cantonments, civil stations, cities, towns, railways, public gardens or other places of public resort, either by filling of tanks or by direct flow, contracts at special rates may be accepted by the Divisional Canal Officer with the previous sanction of the Local Government.

14. *Water power.*—The use of water-power may be granted by the Divisional Canal Officer at such rates, and under such conditions, as may be sanctioned by the Local Government in each case.

15. *Tátíls.*—Divisional Canal Officers are empowered, for purposes of administration, repairs and maintenance, to order the closure of any water-course for periods which shall not extend beyond twelve consecutive days. For longer closures the authority of the Superintending Canal Officer is required. (Section 32 (*a*).)

16. Orders for closures under Rule 15 must be notified either— (Section 32 (*a*).)

(*a*) by a notification,

(*b*) by a special order.

Such notification or order shall be in writing under the hand of the Divisional Canal Officer, and a copy shall be conveyed by the Canal establishment with due expedition to each village concerned, and delivered to the Patwári, or, in his absence, to any Lambardár. The receipt of each person to whom a copy of the notification or order is delivered shall be affixed to a schedule prepared for the purpose, which shall be recorded in the Divisional canal office.

It shall be the duty of the Patwári or Lambardár who receives the notification or order above described to affix it at once in a conspicuous position in the village, and to make its purport generally known.

17. *Stoppage of supply in improperly maintained water-courses.*—Stoppage of supply of water to any water-course, under Section 32 (*a*) (2) may be enforced when the Canal Officer ordering the stoppage has satisfied himself, by personal inspection, that the water-course is not maintained in proper repair. The order for such stoppage shall be in writing under the hand of the Divisional Canal Officer, and an immediate report shall be made to the Superintending Canal Officer, and the special grounds for stoppage explained. The Superintending Canal Officer's order shall be final. (Section 32 (*a*).)

18. *Report of closures.*—Immediate report shall be made to Superintending Canal Officer of all closures under case (1), Section 32 (*a*). (Section 32 (*a*).)

19. Nothing in the foregoing rules shall be taken to affe[illegible] of a Canal Officer to close any water-course, or stop any sur[illegible]ct the power his own authority in cases which he deems to be of pressing [illegible]ply of water, on

20. *Claims for remission.*—All claims for remission o[illegible] emergency. Section 32 (*b*), shall be made to the [illegible] occupier's rate, under previous to the cutting of the [illegible] Divisional Canal Officer [illegible] crop. The Divisional Canal (Section 32 (*b*).)

Officer may reject or admit any claim. If the claim be admitted, the Divisional Canal Officer may remit to the limit of 50 Rupees in each individual case, provided that the aggregate remissions for any one village do not exceed 200 Rupees. If the Divisional Canal Officer considers that higher remissions should be granted than those above specified, the sanction of the Superintending Canal Officer must be obtained. Pending the decision, the collection shall be suspended.

Claim to remission of ordinary charges, other than occupier's rates, payable for the use of the canal water, shall only be admitted on proof of actual loss caused by the stoppage of supply; on proof of such loss, the whole, or any portion of the charges, may be remitted as herein before provided.

If a claim for remission of ordinary charges, other than occupier's rates, be rejected by the Divisional Canal Officer, the claimant may prefer an appeal to the Superintending Canal Officer.

PART V.

OF WATER-RATES.

Section 36.

21. *Charges for the use of water.*—The charge for the use of water shall be made on the area irrigated at the rates specified in the schedules for the time being in force, and subject to the following rules:—

Section 36.

22. *Charge leviable for "paleve" when no crop is sown.*—When a field receives the first or preliminary watering, and afterwards no crop is sown, the lowest rate of charge for "lift" or "flow," as the case may be, will be imposed. One watering after the crop has been sown shall be charged for at the rate leviable for the whole crop, or the whole year, as the case may be.

23. *Charge for mixed crops.*—If mixed crops be grown in the same field, the occupier's rate shall be calculated on the highest rated crop.

24. *Charge for different crops grown in the same field.*—If different crops be grown in different parts of the same field, the occupier's rate shall be calculated on the highest rated crop, unless the division between the crops shall have been clearly defined by a ridge not less than half a foot high.

25. *Charge leviable on fields re-sown.*—When the original crop sown in a canal-irrigated field fails, and is ploughed up, and a fresh crop sown in the same season, the occupier's rate to be levied is that due on the crop which comes to maturity.

Section 36.

26. *Occupier's rate for fields partly irrigated.*—If only a portion of a field be irrigated the occupier's rate shall be chargeable on the whole field unless such portion shall have been clearly demarcated by a ridge not less than half a foot high.

Section 36.

27. *Charge leviable on fields partly irrigated from canals, partly from wells or other sources.*—Where a portion of a field has been irrigated with the canal water, and a portion with water from a well or any other source, the whole field will be treated as irrigated with canal water, unless a clearly distinguishable boundary, demarcated by a ridge not less than half a foot high, exists between the two portions. Where such a boundary exists, enquiry will be made whether the use of water from a well or any other source was owing to deficiency in the supply of canal water, in which case the canal charge on the portion irrigated by canal water should be reduced to lift rates.

28. *Use of canal water-courses for conveyance of water from a well or any other source.*—If water from a well or any other source is conveyed in the same channel as canal water in the course … of the irrigation from that channel during such … from the canal.

… *escapes.*—Irrigation … shall

31. When a natural drainage channel or reservoir, no… the canal, is used as an escape channel, if it is so used at the re… desirous of irrigating from it, the same rates shall be chargeab… from it as for irrigation from an escape channel. Provided t… any, irrigated from it previous to the introduction of canal wa… liable to water rate; the amount of such area shall be determined… Commissioner. In all cases in which water is supplied und… written contract shall be executed, setting forth the terms … supplied.

32. *Charge leviable for the unauthorized use of water.*—… ting from a Canal without permission, or taking water at time… proper authority, shall be chargeable with a special water rate … double the water rate which would have been chargeable for … irrigation of the area irrigated.

The area shall be measured, and notice shall at once b… persons so irrigating that they will be charged in the demand st… rates under this rule for the area thus watered.

Section 36.

33. *Charge leviable for "Ab-zai" (waste of water).*—The… able for water used in an unauthorized mann… ed to run to waste, shall be—

(1) On cultivated lands,—double the crop rate which w… be leviable on the area flooded.

(2) On uncultivated lands,—the flow rate chargeable for … ing before sowing.

The area shall be measured up as soon as possible, an… chargeable with this rate having been determined in accordance … visions of Section 33 of Act VIII of 1873, notice shall be give… they will be charged accordingly in the demand statement.

The special rates mentioned in this and the preceding rul… addition to such penalties as may be imposed under Section 70 of …

33 A.—In cases where an addition is made to the occup… way of penalty as in Rule 9 A. and Rules 32 and 33, the origin… the occupier's rate only, and not such additional amount, shall be … basis for calculating owner's rate.

34. An appeal against any charges made under Rules 22 t… may be preferred to the Commissioner.

Section 47.

35. *Schedule of rates to be accessible to villagers.*—The Pa… village irrigated by canal shall be furnished by … Canal Officer with a statement in Hindi, or the … ten language of the district, showing the rates of assessment of … produce per ordinary local and canal measurements, which stat… suspended in the *Chaupal* or other place of public resort.

Section 47.

36. *Patwáris' fees.*—The allowance to Patwáris employed … tion Department shall be 2 per cent. on the am… tion; this payment to be conditional on … satisfaction to the Divisional Canal Officer in respect to their dut… tion with the measurements and assessments, and to the Deputy … in respect to their duties connected with the collection of canal re…

Section 47.

37. *Lambardárs' fees.*—The allowance to Lambardárs, or … collecting from cultivators shall be 3 per cent. … collected, on condition that the full amount … paid within three months of the issue of the demand statement … Lambardár has performed his duty connected with the asse… personal attendance or deputation of a proper substitute at th… surement, and correct report of irrigation.

Provided that it shall be at the discretion of the Deput… or Divisional Canal Officer, as the case may be, subject to the … by Rule 76, to withhold the whole or part of the allowances pre… 36 and 37, in the event of the conditions not being complied wi…

PART VI.

NAVIGATION.

38. *Tolls.*—When a Government canal shall have been …

Part VI. Sec. 40. Sec. 51. Sec. 53. Local Government open for navigation, tolls and charges on boats and rafts plying thereon shall be levied on such a system and at such rates, as shall be from time to time determined by the Local Government, with the approval of the Government of India; such system and rates being published by notification in the *Government Gazette*.

39. *Ferries.*—Ferry boats shall not be permitted to ply on the canal except under a written license, in the form contained in Appendix II., from the Divisional Canal Officer, and subject to conditions therein laid down. An appeal against an order revoking such license may be preferred within fifteen days to the Superintending Canal Officer.

40. *Measurement.*—Every boat or raft entering a Government canal shall be liable to measurement, for the purpose of ascertaining the amount of toll the boat or raft shall pay according to the Schedule of rates in force for the time being.

41. *Number.*—Every boat, at the time of first measurement, shall be given a serial number, by which it shall be distinguished while plying on the canal. The number shall be fixed on the port or left hand bow of the boat and shall not be less than eight inches in height, and shall be of such a colour as to be easily distinguishable at a distance of 100 yards.

42. *Ticket.*—Every boat on entering a canal shall be furnished with a ticket, in the form contained in Appendix III., which shall specify the number of the boat, the date on which it entered the canal, the name of the owner of the boat, his occupation and place of abode, and the name of the person in charge of the boat. Upon leaving the canal, the Divisional Canal Officer shall enter on the ticket the date of leaving, and shall return the ticket to the person in charge of the boat.

43. *Dimensions.*—No boat above 14 feet beam over all shall be allowed in a canal on which the locks are 16 feet in width, and no boat above 18 feet beam over all in a canal on which the locks are 20 feet in width. No raft of more than 14 feet in width and 90 feet in length shall be allowed on any canal the locks of which are 16 feet; and no raft of more then 18 feet in width and 100 feet in length will be allowed in a canal the locks of which are 20 feet in width.

44. *Tolls payable in advance.*—Tolls on boats are payable in advance, and no boat shall be allowed to leave any canal on which it is plying until all such tolls and charges have been duly liquidated. The officer granting permission for the boat's removal shall sign the certificate at the foot of the ticket given under Rule 42 (Appendix III.) after satisfying himself that all claims against the boat have been paid.

45. *Receipt for tolls.*—Tolls may be paid either to the Divisional Canal Officer, or to the person appointed by him, hereinafter called the Agent, at any of the toll stations and a receipt, in the form contained in Appendix IV., shall be granted for the same.

46. *Pass for boats.*—Upon any boat plying on a canal being freighted, the owner or person in charge shall declare to the Divisional Canal Officer, or his Agent at the place of loading (or if there be none there, to the first he may pass on his journey), an invoice of the cargo showing the nature, weight, value and destination. The Divisional Canal Officer or his Agent shall thereupon, furnish such person in charge with a pass, in the form contained in Appendix V., specifying the foregoing particulars, which pass shall be delivered up to the Agent nearest to the place at which the vessel is unloaded.

47. *Pass to be shown when required.*—It shall be obligatory on the person in charge of a boat to show the pass granted under Rule 42, when called upon to do so by the Divisional Canal Officer or his authorized agent.

48. *Every boat or raft to be navigated by two persons.*—No boat or raft shall be navigated by less than two persons.

49. *Pass for rafts.*—Passes in the form shown in Appendix VI. shall be granted to persons wishing to float rafts down a canal upon application to the Divisional Canal Officer or the nearest Agent. No raft unprovided with a pass shall enter a canal.

50. *Removal of rafts from canal.*—On reaching the destination specified in the pass, the person in charge of a raft shall, within 24 hours deliver

the said pass to the local Agent, who, if all is in good order, shall authorize the removal of the raft, which shall be effected within 48 hours from the time of permission being granted, unless written authority to defer removal be given by the Agent.

51. *Divisional Canal Officer empowered to remove rafts*—Rafts not removed within the time required by Rule 50, and rafts found unattended, may be taken out of the water by the Divisional Canal Officer, or his Agent.

52. *Rafts without passes.*—Any raft found in a Government canal unprotected by a pass may be charged with double toll reckoned on the distance from the head of the canal to the place where such raft shall be removed from the canal.

53. *Double rates to be charged for excess over quantity shown in pass.*—Double rates shall be leviable on all articles in excess of the quantity of each kind specified in the pass granted under Rule 49.

54. *Removal of rafts lodging against Canal works.*—Every person floating a raft in a canal shall so navigate it that it shall not lodge against any canal works; and if any raft so lodges or causes obstruction, it shall at once be broken up and removed by any Canal Officer on the spot.

55. *Masts.*—Boats must have their masts fitted so that they can be let down with ease and speed; and no mast shall be so high as to strike or scrape any bridge under which the boat may pass.

56. *Boats and rafts to be fastened fore and aft.*—Every boat or raft which is brought-to alongside of a canal bank or wharf must be securely fastened fore and aft to the bank or wharf: no boat or raft can be brought up outside another so moored without the permission of the Divisional Canal Officer.

57. *Boats and rafts to be moored so as not to obstruct traffic.*—No boat or raft shall be placed in such a position as to endanger the safety of other boats or rafts, or to obstruct the passage, or to impede navigation; and no bamboos or poles shall be allowed to be erected, or to remain erected on vessels moored to the bank.

58. *Every boat or raft when brought-to to have some one on board.*—Every boat and raft when brought-to shall at all times have some person in attendance on board.

59. *Wrecks.*—In every case of a wreck or obstruction of a canal channel by a sunken, or partially sunken, boat or raft, the Divisional Canal Officer may call upon the owner or person in charge to remove the same without delay. Should the owner or the person in charge not be forthcoming, or should he refuse to remove the wreck or obstruction, or should he not within 48 hours commence to remove the wreck or obstruction, then the Divisional Canal Officer may undertake the removal under Section 49 of the Act.

60. *Banks or berms not to be used as wharves.*—The banks or berms of the canal shall not be used as wharves for the deposit of goods, except with the permission of the Divisional Canal Officer, or of some person authorized in his behalf.

61. *Goods to be removed from canal lands.*—All goods shall be removed from canal lands within seven days, unless the written permission of the Divisional Canal Officer be obtained to their remaining longer. All goods deposited on canal lands must be properly stacked, and so placed as not to interfere with other traffic. In the event of such goods not being removed when required, a charge of four annas per 100 maunds per diem shall be levied, when the goods are susceptible of being reckoned by weight, or a proportionate charge shall be determined by the Divisional Canal Officer when the goods are reckoned by number. This rule does not apply to canal ware-houses, for which special rules will be framed.

62. *Boats or rafts liable to be examined.*—Any boat or raft plying on a canal may be examined by any Canal Officer, of rank not inferior to a Sub-Divisional Canal Officer, or by any Agent, provided that there is reason to believe that the owner or the person in charge thereof is attempting to evade the canal rules.

63. *Canal closures.*—Any canal may be closed once a year for the execution of needful works, on one month's notice published in the *Government Gazette* of the intention so to close it. Any canal may also be closed at any time without notice in the event of any sudden emergency, and no claim for

compensation to any owner, or person in charge of any boat or raft navigating the canal, shall be created by unavoidable detention resulting from such closure; or from the depth of water being at any time unavoidably reduced in the canal; or from the failure of any weir, lock, bridge or other work in the canal bed. The fact of an emergent closure having been authorized shall be notified in the *Government Gazette.*

PART VIII.

Of obtaining Labour, &c.

64. Persons exercising the handicrafts detailed below, shall in addition to the agriculturists, be deemed labourers for the purposes referred to in Part VIII:—

Part VIII—Section 53.

Workers in leather ...	*Mochi.*	Water-carrier	*Bhisti.*
Ditto oil	*Teli.*	Barber	*Nái.*
Ditto earthenware ...	*Kumhár.*	Bearer	*Kahár.*
Weaver	*Juláha.*	Fisherman	*Jhiwar.*
Washerman...	*Dhobi.*	Millers generally	*Kahár.*

PART X.

Of Offences and Penalties.

65. *Offences under Canal Act triable by Magistrates of the 2nd Class.*—

Section 70. The Lieutenant-Governor is pleased, under Section 70 of the Act, to direct that charges of offences under that section shall be cognizable by a Magistrate of the 2nd Class.

66. No person, without the permission, in writing, of the Divisional

Section 70—Class II. Canal Officer, shall pass, or shall cause any animal or vehicle to pass on or cross any of the roads, works, banks or channels of a canal, or drainage work, after he has been desired to desist therefrom, excepting upon such bridges, fords and ferries, and their approaches, as are provided by the Divisional Canal Officer.

PART XI.

Subsidiary Rules.

67. *Assessment and realization of occupier's rate.*—The amount demandable for occupier's rate shall be determined and apportioned by the Divisional Canal Officer, and the Deputy Commissioner shall realize the sums due.

68. *Khataoni to be accessible to villagers.*—The Patwári is responsible

Section 75. that the village copy of the *khataoni* or demand statement is at all times accessible to any person who pays for canal water.

69. *Distribution of parchas.*—As soon as the *khataoni* is completed, the Amín shall tender to each cultivator a *parcha*, or slip, containing the particulars of water-rate due from him, with the date on which it was given noted on it. All *parchas* remaining unclaimed shall be left for delivery with the Patwári of the village, or, in his absence, with the Lambardár. The *parchas* shall be in the form detailed in Appendix VII.

70. *Complaints against Khasrah entries.*—If a cultivator desires to con-

Section 75. test the correctness of the entries made against him in the demand statement, whether as to the fact of the land having been irrigated, or of its being charged "flow" or "lift," or as to the measurement and entries of class or crop, he must lodge a complaint with the Divisional or Sub-Divisional Canal Officer, or Deputy Collector, within twenty-one days of date of receipt of *parcha* by the cultivator; or, if he should not have received a *parcha*, within ten days of the date on which he first became acquainted with the claim against him, and the complaint must be investigated on the spot within fifteen days of receipt, and promptly decided.

The order of the Divisional or Sub-Divisional Canal Officer, or Deputy Collector in such cases, shall be forthwith communicated to the complainant, and shall be subject to appeal to the Commissioner of the Division.

71. *Objections may be made by a Lambardár, &c., on behalf of cultivator.*—

Section 75. When a Lambardár or other person is responsible, under Sections 46 and 47 of the said Act, for the payment of the occupier's rates in a village or any portion of a village, complaints under these rules may be lodged by such Lambardár or Contractor, instead of by the cultivators, and any refund that may be necessary in consequence of the order passed upon objection so lodged, shall be paid by the Deputy Commissioner to such Lambardár or Contractor on account of the cultivators concerned.

72. *Method of dealing with alterations in the demand.*—If, after the giving of the *parcha*, any addition is made to the demand, or any reduction is allowed on a complaint under Rule 22 or 37, or by way of remission under Section 32, clause (*b*), of the Act or otherwise, such addition or reduction shall be communicated to the cultivator by means of supplementary *parchas.* Demands shall be shown in black, and remissions in red letters. All such alterations as are made before the despatch of the *khataoni* to the Deputy Commissioner shall be included in that document, and shall also be written on slips similarly printed (black for additions and red for reductions) and attached to the *khataoni.* Alterations made after the despatch of the *khataoni* shall be communicated to the Deputy Commissioner by means of similar slips.

73. *Objections to the demand.*—Objection to the demand urged before the Deputy Commissioner shall be referred by him to the Divisional Canal Officer, the collection not being suspended except on the receipt of an intimation from the Divisional Canal Officer that an objection has been admitted by him.

74. *Irrecoverable balances.*—Balances found to be irrecoverable owing to want of assets, absconding of defaulters, or any other such cause, and claims to refund on the ground of mistakes in collection shall be dealt with by the Deputy Commissioner under the rules for suspension, remission and refund of land revenue.

75. *Payments of refunds.*—In all cases payment of refunds will be made

Section 75. by the Deputy Commissioner.

76. *Appeal against retrenchment of fees.*—An appeal against retrench-

Section 75. ment of fees of Lambardárs and Patwáris shall lie to the Commissioner of the Division or Superintending Canal Officer, according as the retrenchment has been made by the Deputy Commissioner or Divisional Canal Officer.

77. *Receipts for water-rate.*—Receipts shall, when demanded, be given by the Lambardár or other person making the collection to each cultivator on payment of occupier's rate.

78. *General prohibition.*—No person employed on a canal shall, without

Section 75. previous sanction obtained from the Divisional Canal Officer, have any interest in the distribution or use of water from the said canal, or purchase, or bid for, any Government property sold thereon, either in his own name, or in the name of another, or jointly, or in shares with others.

Procedure.

79. *Special Rule of Procedure for the Dera Gházi Khan District.*—In the Dera Gházi Khan district appeals under Section 32 (*b*) of the Act shall lie to the Superintending Canal Officer, and those under Sections 33 and 34 shall lie to the Deputy Commissioner of the district.

Of Appeals and References, and the Procedure therein.

80. *Interpretation.*—In the following Rules the expression "the Court" denotes the Officer to whom in the particular case an appeal may be preferred under the provisions of the Act, or the Rules made thereunder for the time being in force.

81. *No appeal except when expressly given.*—No appeal shall lie from any decision or order given or made under any provision of the Act, except where an appeal is expressly allowed by the Act or by the Rules made thereunder for the time being in force.

82. *Period for appealing.*—The period for presenting an appeal shall be thirty days, unless any other period is expressly prescribed, and in the latter case the period so prescribed.

But any appeal may be admitted after the period prescribed when the

Extension of time. appellant satisfies the Court that he had sufficient cause for not presenting the appeal within such period.

If the period prescribed expires on a day when the Court is closed, the appeal may be presented on the day that the Court re-opens.

83. *Calculation of period.*—The period prescribed shall be calculated from the date of the decision or order appealed from, and in computing such

period the day when the decision or order was made, and the time requisite for obtaining a copy of the decision or order appealed against shall be excluded.

84. *Form of appeal.*—The application for admission of an appeal shall be stamped in accordance with the law in force relating to Court fees, and shall be accompanied by a copy of the decision or order appealed against, and shall state concisely the grounds upon which the appeal is preferred.

85. *When appeal may be summarily rejected.*—The application may be rejected if, upon a perusal of the grounds of appeal and the copy of the decision or order appealed against, it appears to the Court unnecessary to call for the proceedings.

86. *Procedure on admission of appeal.*—If the application be granted an entry thereof shall be made in a register of appeals, numbered consecutively, and a day shall be fixed for the hearing of the appeal.

87. *Notice of hearing to be given.*—Notice of the date and place fixed for the hearing of the appeal shall be given to the appellant in such manner as the Court may direct, and to every other party to the case whose interest is opposed to that of the appellant in the manner hereinafter prescribed.

88. *Contents of notice.*—A written notice containing the title of the Court, the names of the parties, the date and place fixed for the hearing of appeal, and such other particulars as the Court may, by general or special order, direct, shall be issued in duplicate under the hand and seal of the Court.

89. *Mode of service.*—The notice shall be served by delivering one copy thereof, if practicable, to the person addressed therein, or, in his absence, to some adult male member of his family, or if none such be found, by leaving such copy at the addressee's usual place of residence. Provided that, if the Court shall so direct, the notice may be served under registered cover sent through the Post Office.

90. *Acknowledgment of personal service.*—When personal service is effected, the addressee shall be required to acknowledge the service by affixing his signature, seal, or mark on the back of the duplicate copy to be retained by the serving officer.

91. *Memorandum by serving officer.*—The serving officer shall in every case endorse on the duplicate copy a memorandum signed by him of the date and mode of service, and return such copy to the Court which issued it.

92. *Cost of service.*—The cost of serving any notice shall be borne in the first instance by the party appellant, and shall be paid to the proper officer of the Court before such notice is issued. The charge made for service shall be in accordance with the lowest civil process scale for the time being in force.

93. *Hearing may be postponed or adjourned.*—The hearing of an appeal may be postponed or adjourned from time to time, as the Court may see fit by written order to direct, to any subsequent date, and notice of such date shall be given to the parties in such manner as the Court may direct.

94. *Attendance or representation of parties not essential.*—The attendance of the parties in person or by representative, shall not be necessary at the hearing of any petition of appeal, or of any appeal, but any party so attending shall be entitled to be heard.

95. *Court to be satisfied before hearing that notice has been received by parties.*—The Court shall not proceed to the hearing of any appeal unless and until it is satisfied that notice of the date and place fixed for such hearing has been received by the parties concerned in sufficient time to permit them to appear or to be represented at such hearing. Provided that the Court may presume that notice has been received when a written notice has been served in any of the ways described in Rule 89 above. Provided also that an appeal may be heard and decided, notwithstanding the absence of any party who is shown to the satisfaction of the Court to be wilfully evading service of notice.

96. *Procedure on hearing*—(*a*). The Court, before passing its order or decision on the appeal, shall record in writing which (if any) of the parties to the appeal are present, in person or by representative, at the hearing thereof.

What parties present.

(*b*). The Court, if it think further inquiry necessary, may conduct such inquiry itself, and in such case shall be deemed to be an officer with the powers described in Section 69 of the Act.

Further inquiry by appellate Court.

(*c*). When the hearing of the appeal is concluded, the decision or order

The decision or order of Court.

of the Court shall, when practicable, be pronounced forthwith, and shall be recorded in writing signed by the Court, and the substance thereof shall be explained to such of the parties or their representatives as are present when the decision or order is passed or given.

(*d*). Every decision or order recorded in English shall be translated into Urdu, and the translation shall be authenticated by the signature of the Court and filed with the proceedings.

Translation thereof.

97. *Copy thereof to be sent to Subordinate Officer.*—A copy of the decision or order shall be transmitted by the Court to the officer from whose decision or order the appeal was preferred.

98. *Copies to be granted to parties.*—A copy of the decision or order of of the Court, in English or Urdu, shall be granted to any person concerned or interested therein, who shall apply for the same, upon payment of the proper Court fees and copying charges.

99. *Of re-hearing in certain events.*—If any party against whom an order or decision is made or given upon an appeal heard in his absence shall, within thirty days from the date of such order or decision, satisfy the Court that he had received no notice of the time and place fixed for the hearing thereof, or had not received such notice in sufficient time to permit him to appear, and that he did not wilfully evade service thereof, the Court may pass an order, if it think such order requisite for the ends of justice (and not otherwise), upon such terms as appear just, setting aside its previous decision or order, and grant a re-hearing, which shall be subject to the same rules as the hearing of an appeal.

100. *Power of revision by Financial Commissioner and Chief Engineer.*—The Financial Commissioner may at any time call for any case which has come before a Commissioner otherwise than under Section 19 of the Act, or before a Deputy Commissioner, and the Chief Engineer may at any time call for any case which has come before a Superintending or Divisional Canal Officer, and pass such orders thereon consistent with the Act and the rules made thereunder as may seem proper.

101. *Power of revision by Local Government.*—Orders passed by the Financial Commissioner shall be subject to review by the Local Government in the Revenue Department, and orders passed by the Chief Engineer to review by the Local Government in the Irrigation Branch, Public Works Department.

102. *Finality of orders and decisions of Appellate Court.*—Except as provided in the three last preceding rules, or as may be otherwise expressly provided in the rules for the time being in force, the order or decision passed upon any appeal shall not be final.

103. *Scope of Rules.*—Nothing contained in the foregoing rules applies to the hearing of an appeal from any decision or order in a criminal case under the Act.

104. *Procedure upon reference under section 27.*—Upon a reference to the Commissioner under Section 27 of the Act, the procedure shall, so far as may be, be the same as is prescribed in Rule 2 upon a reference under Section 20 of the Act.

105. Except as provided in Rule 2 and in the last preceding rule, no person shall be entitled to be heard in person or by representative before the Superintending Canal Officer, Commissioner, or other higher authority to whom, under the provisions of the Act or the foregoing rules, any matter is submitted or referred for sanction, approval, or decision. Nothing in this rule shall preclude the persons concerned from submitting, for the consideration of any such officer or authority, petitions relating to any matter so submitted or referred.

APPENDIX I.

APPLICATION FOR WATER-COURSE FROM CANAL, VILLAGE PARGANNA , DISTRICT ,

For *Crop of* 18 .

1. Name of applicant.
2. Name of supply-channel.
3. Proposed site of new outlet.
4. Approximate area of land to be irrigated.
5. Number of pipes required.

6. Irrigation by overflow or lift.
7. Approximate length of water-course.
8. Names of owners of lands to be traversed by water-course.
9. Land irrigable from any existing outlet or not.
10. Number and names of intending shareholders (if any) in the outlet applied for.
11. Number of outlets now in supply-channel { Right bank. Left bank.
12. Width of bank, including slope and pathway.
13. Number of outlets now allotted to village.
14. Culturable area { Whole village. Applicant's lands.
15. Area already provided with irrigation { In village. In applicant's holding.

N.B.—Columns 11—15 to be filled in, in Canal Office.

APPENDIX II.

LICENSE FOR FERRY BOAT — CANAL.

Position of ferry.
Dimensions of boat or raft.
Name of person to whom license is granted.
Period for which license is granted.
Tolls leviable at ferry.

Conditions.

This license may be revoked without any compensation thereby becoming claimable by the licenser if tolls be levied in excess of those specified above, or if the boat be not maintained in proper working condition, or if delays or obstructions to travellers occur, or for other fault which, in the judgment of the Divisional Canal Officer, demands it. Appeal against the orders of the Divisional Canal Officer shall lie to the Superintending Canal Officer.

(Sd.) A. B.,
Executive Engineer,
Station and date. } *Division* *Canal.*

APPENDIX III.

No. TRAFFIC DEPARTMENT, CANAL,
PASS TICKET. 18 .

Boat No.
Date of entry.
Owner's name.
Occupation.
Residence or place of business.
Name of person in charge.
Measurement of boat.
Estimated carrying capacity maunds.
Tolls paid from 18 to 18 .
Amount Rs. Annas Pies.
By whom issued.
Navigation. *Station.*

Date of leaving Canal.

I hereby certify that all demands against Boat No. for tolls, right of way, damage to canal works, &c., &c., up to date, have been satisfied.

Navigation Agent.

APPENDIX IV.

No. TRAFFIC DEPARTMENT. CANAL.
Received from 18 .
Rupees Annas Pies being amount of toll on boat No.
From to
Rs.
Navigation Department *Canal,*
In charge of *Station.*

APPENDIX V.

No. TRAFFIC DEPARTMENT, CANAL.
PASS FOR BOAT NO.
Station, dated 18 .

1. Date of departure.
2. Name and address of owner of boat.
3. Name and address of owner of cargo.
4. Description of cargo.
5. Weight of cargo in maunds (Government).
6. Place of departure on canal.
7. Destination of canal.

8. Ultimate destination.
9. Distance by canal.
10. Rate of freight.
11. Amount of freight.
12. Value of cargo.
13. Number of passengers.
14. Remarks.

Signature of Navigation Agent.

APPENDIX VI.

No. TRAFFIC DEPARTMENT CANAL.
RAFTING PASS 18 .

FROM To
Distance miles
Description of rafts
Dimensions
Cubic contents
Rate of Tolls, Rs.
Amount paid, Rs.
Estimated value of rafts, Rs.
Name of owner
Residence
Name of person in charge
Date of entering canal

Rs. *Canal.* *(Signature.)*
RECEIVED AT *Station*
of 18 . *Navigation Agent.*

APPENDIX VII.

Statement of land irrigated by *in Mauza* *Pargana,* *Zilla*
during Fasl 18 .

Date of giving *parcha.*	Number of Field.		Area and Nature of Irrigation.		Name of crop.	Demand.	Remarks.
	Khatauni.	Settlement.	Flow.	Lift.			
							Enter particulars of cultivator's parentage, caste, &c., where confusion is likely to arise from men having the same names, or explanatory details regarding irrigation.

(*Punjab Government Notification No.* 3725 *I., dated* 17*th August* 1878,—*Punjab Gazette of* 29*th idem*).

B.

Rules as to the Assessment of Owner's Rate under Sections 37, 38 and 39 of Act No. VIII of 1873.

(a)—On the Agra Canal.

(Notification No. 4059, dated 17th September 1875—*Punjab Gazette* of 23rd idem.)

The Lieutenant-Governor has, with the sanction of the Governor-General in Council, laid down the following rule, for the assessment until further orders, of the "owner's rate" under Sections 37, 38 and 39 of this Act, in certain lands irrigated from the Agra Canal, in the districts of Delhi and Gurgáon :—

RULE.

In all estates into which canal irrigation has been introduced for the first time since last settlement, and shall hereafter be introduced, the owner's rate shall, until further orders, be assessed at one-third of the occupier's rate leviable on occupiers of canal irrigated lands.

Proviso 1st.—The owner's rate shall nowhere exceed the sum which, under the rules for the time being in force for the assessment of land revenue, might be assessed on such land on account of the increase in the annual value or produce thereof, caused by the canal.

Proviso 2nd.—All lands irrigated from wells or other sources at the time of the last settlement, and then assessed at irrigated rates, shall be excluded from the operation of owner's rate.

2. This rate will be first collected for the rabi fasl of 1874-75, A.D.

(Notification No. 4060, dated 17th September 1875—*Punjab Gazette* of 23rd idem.)

The Lieutenant-Governor has, with the sanction of the Governor-General in Council, laid down the following rules for the assessment of the "owner's rate" under sections 37, 38 and 39 of this Act in lands irrigated from the Agra Canal which are not assessed to Government revenue :—

RULE.

1. In all such lands the owner's rate shall, until further orders, be assessed in the same manner as in lands assessed to Government revenue.

2. In all such lands, the owners of which are also grantees of the land revenue, the rate will be first collected for the kharíf fasl of 1877 A.D.

3. In all cases when the owners are distinct from the grantees of the land revenue, the rate will be first collected for the khaíf fasl of the present year 1875, A.D.

(b)—On the Western Jumna Canal.

(Notification No. 576½, dated 25th June, 1880—*Punjab Gazette* of 1st July.)

The Lieutenant-Governor has laid down the following rule for the assessment of the owner's rate under the above sections on all lands irrigated for the Western Jumna Canal, in the districts of Delhi, Rohtak, and the Panipat tahsíl of Karnál, and that part of the Karnál tahsíl which formerly belonged to the Panipat district, and has been re-assessed in the Settlement of the Karnál district now in progress.

RULE.

In all estates receiving irrigation from the Western Jumna Canal the owner's rate shall, until further orders, be assessed at one-half of the occupier's rate leviable on occupiers of canal-irrigated lands.

Proviso 1st.—The owner's rate shall nowhere exceed the sum which, under the rules for the time being in force for the assessment of land revenue, might be assessed on such land on account of the increase in the annual value of produce thereof caused by the canal.

Proviso 2nd.—All lands irrigated from wells or other sources besides canals, and assessed at irrigated rates at the settlement now in force, shall be excluded from the operation of owner's rate.

2. This rate will be first collected in the Panipat tahsíl from the autumn harvest of 1878-79, and in the rest of the tract under reference, from the autumn harvest of 1879-80.

C.

General Rules as to claims to Owner's Rate or to Water-Advantage rate on the part of Assignees of Land Revenue.

Circular No. 7-S., dated Lahore, the 28th February 1882.

From—F. C. Channing, Settlement Secretary to Financial Commissioner, Punjab,
To—All Commissioners and Deputy Commissioners, Punjab.

Irrigation. Instructions applying to the owner's rate system, published for guidance of District Officers.

The following instructions apply in the first instance only to the districts of Delhi, Gurgáon, Karnál and Rohtak where the owner's rate system has been introduced at the recent settlements: but they are published for the guidance also of officers in other districts, to which the same system may hereafter be extended.

2. Owner's rate is due from all lands which receive canal irrigation, except when the land has been assessed as irrigated at settlement, or where the owner's rate has, under a special order of the Government, been remitted in favor of a holder of revenue-free land. The rules which govern the remission or alienation of owner's rates to revenue assignees have been already communicated to the Commissioners of Delhi and Hissár and will shortly be published for general information. It has been ruled that the Irrigation Department is entitled to a book credit of the amount of owner's rate which it would have received had the land not been assessed at irrigated rates or not been held by revenue assignees, as the case may be.

The following instructions are issued by the Financial Commissioner to provide for the calculation of this book credit and to arrange for the collection or remission of owner's rate on well, jagír and máfi lands.

3. The khatauni, or statement of demand, which is forwarded by the Executive Engineer to the Deputy Commissioner will be in the amended form accompanying this circular, and not in that which accompanies this office Circular No. 64 of 1870; this statement, which will be in the vernacular, will show in column 14 the total amount of occupier's rate leviable from each cultivator, and in columns 15, 16, 17 and 18 will show separately—

(1) In column 15 the amount of owner's rate which would have been due on chahi lands assessed at irrigated rates, but for the exemption of such lands under Section 39 of the Canal Act (Nominal demand on chahi lands).

(2) In column 16 the amount remitted to revenue-free holders.

(3) In column 17 the amount to be collected for revenue assignees.

(4) In column 18 the amount to be collected for Government.

Column 19 shows the total amount of owner's rate to be collected from each owner; this will be the total of columns 17 and 18, and column 20 shows the amount due as cesses on the owner's rate demand including that remitted to revenue-free holders (column 16) but excluding the nominal assessment on well lands (column 15).

The Executive Engineer will also forward to the Deputy Commissioner the Form III A accompanying this circular; this is the form for owner's rates corresponding to the Form III already in use for occupier's rates; it is an English abstract of the Vernacular statements of demand.

4. The Deputy Commissioner will submit monthly, to the Executive Engineer, a statement of demands, collections and balances of owner's rate in

the Form which accompanies this circular, and which is numbered No. VI A; the corresponding statement for occupier's rate, No. VI, is already forwarded by him monthly. He will include in the demand the total amount of owner's rate shown by the Canal Officer as due (column 8 of Form III A), but he will at once write off under the deductions the amounts remitted on well lands, remitted to revenue-free holders and to be collected for revenue assignees. From this statement the Irrigation Officers will be able to compile their accounts and to prepare their statements of the book credit of owner's rate due to the canals. It is true that the information as to the amount of the owner's rate not due to Government is taken by the Deputy Commissioner from the statement IIIA supplied by the Canal Officer, and the figures might, perhaps, have been omitted from the statement of demands and collections; but it is considered that their inclusion will be useful and convenient.

5. The Financial Commissioner understands that the Canal Officers have been supplied with lists of the fields which will be exempted from owner's rate as assessed at irrigated rates. *It must be remembered that the owner's rate assessment on these lands is nominal only, and that no cesses will be charged on it. If the lists in question have not yet been supplied in all cases this should now be done.*

6. In the case of máfi and jagír lands, where the Government has sanctioned the grant or remission of owner's rate the following rules will be observed :—

(*a*) In the case of all petty Máfidárs and all Jagírdárs, who are also the owners of the land on which the owner's rate is due, the Canal Officer will show the amount of owner's rate under the heading "remissible to revenue-free holders." This ruling will stand good even where the petty Máfidárs are not themselves the payers of the owner's rate; in that case they will themselves make the collections.

(*b*) In the case of other revenue assignees entitled to the proceeds of the owner's rate, the Canal Officer will show the amount under the heading to be collected for revenue assignees, and the Deputy Commissioner will then collect the amounts so entered, and pay them over to the assignees. He will treat the owner's rate thus collected for Jagírdárs in the manner laid down in the rules under the land Revenue Act, Chapter F, for the collection of assigned land revenue on behalf of the assignees, except that no charge will be made for collection, inasmuch as the task of collection is not undertaken by the Government at the request of or owing to the failure to make proper arrangements of the assignees.

7. In order to enable the Canal Officer to enter the necessary details in his statements he must be supplied by the Deputy Commissioner with two lists; one showing all lands on which the owner's rate is simply remitted, and the other showing all lands on which the owner's rate is assigned but will be collected and paid over to the assignees. Full details of the Government orders sanctioning the grant or remission of the owner's rate should be quoted in these lists, and, where the orders sanctioning the grant have been passed on general statements, a reference should be given in each case to the number in the statement, and, in the case of simple remissable owner's rate, the Deputy Commissioner should give the Máfidár or Jagírdár owner a certificate of his exemption from owner's rate, specifying the term of the exemption and the land to which the order extended.

8. For the purpose of more easily distinguishing revenue-free lands, it is desirable that these should be distinguished on the field map by a special mark or colour. In the case of lands attached to wells and assessed at irrigated rates, His Honor the Lieutenant-Governor desires that the canal water should be given as far as possible to the same fields every year.

(*Forms omitted.*)

Circular No. S-S., dated Lahore, the 6th March 1882.

From—F. C. Channing, Settlement Secretary to Financial Commissioner, Punjab,
To—All Commissioners and Deputy Commissioners, Punjab.

Irrigation.
Publishes, for general guidance and information of all Commissioners, Deputy Commissioners, and Canal Officers, rules regarding the assessment and collection of owner's rates in canal-irrigated jagír and máfi lands.

In the re-settlement of the Lahore, Amritsar and Gurdáspur districts, under the supervision of Mr. Prinsep, a new system of assessment was introduced. By it canal-irrigated lands were assessed in respect to the fixed land-revenue demand as unirrigated, in order to allow of a separate rate being taken from year to year on land actually receiving canal water. This rate was called water-advantage revenue. The question whether this rate would go in all cases to revenue assignees then came up, and was at first decided in their favor, but shortly after, the question was reconsidered by the then Lieutenant Governor, Sir H. Davies, and the original decision modified. In a letter, dated the 24th July 1871, the Lieutenant-Governor, directed that wherever water should thereafter be for the first time given from a canal constructed by Government, the proceeds of the water-advantage rate were to be credited to the State; and in another letter, dated the 27th January 1873, he ruled that the surrender of the water-advantage rate to revenue assignees of lands which were canal-irrigated previous to the settlements should not be continued beyond the term of those settlements then sanctioned for a term of 10 years only, except in certain specified cases.

In this office, action on these orders was deferred in expectation of an approaching revision of settlement of the districts concerned, and when subsequently the terms of their settlements were extended to 20 years, the necessity of publishing the order of 1871 for the guidance of Deputy Commissioners and Canal Officers was overlooked.

2. When the Montgomery district came under re-settlement, the claims of Jagírdárs to half the fluctuating revenue derived from the crop rates on canal irrigation were admitted; and it was not distinctly stated whether this surrender was or was not to apply to the case of grants made, or for the first time irrigated after the settlement then being made.

3. The whole question has now been reconsidered in connection with the claims of revenue assignees of lands watered from the Western Jumna Canal to the owner's rate, assessed under Part V of Act VIII of 1873, the proceeds of which have been declared by the Government of India to be canal revenue, and not land revenue; and the following rules, which have received the sanction of the Government of India, are now published for general guidance and information.

General Rules for all new Jagír or Máfi grants and for old grants to which canal irrigation has not heretofore extended.

1. In the case of (*a*) all new grants which may be made hereafter, or (*b*) of lapsing grants continued to heirs by review of former orders, or (*c*) of old grants to which canal irrigation has not heretofore extended, the grantees shall not get the owner's rate. This rule in respect to grants of class (*c*) shall be subject to the following proviso :—

Proviso.—If, owing to supersession of irrigation from wells or other private works, by irrigation from a Government canal, particular fields, forming part of a jagír or máfi grant and assessed with land revenue at irrigation rates, shall, at a settlement subsequent to the grant, be assessed at dry rates and made liable to a separate charge of the nature of owner's rate, then the grantee (if not also the proprietor or cultivator of the land) shall be entitled to compensation for the loss of the irrigated rate of land revenue which he formerly received on such fields. The compensation may take the form of an assignment of the whole or part of the owner's rate on such fields, or of a lump sum cash payment, or of a separate additional assignment of land revenue, as may seem most advisable in each case.

General Rules for all old (*i.e.*, previously made) Jagír or Máfi grants to which canal irrigation has been heretofore extended.

1. If the grant was irrigated from a Government Canal, either when the grant was first made or before the first regular settlement, and the grantee has hitherto enjoyed, either in the way of assignment of remission, the owner's rate or a land revenue assessed by the old procedure at canal irrigated rates, he shall get the owner's rate in future.

2. If the grant was not irrigated by the canal, either when the grant was first made or before the first regular settlement, the grantee shall not get owner's rate; but this rule shall be subject to the following provisos :—

Proviso I.—If, on the Bari Doáb and Upper Sutlej Inundation Canals, the Government has heretofore surrendered to the grantee the charges equivalent to owner's rate, *viz.*, the water-advantage rate on the Bari Doáb Canal and on the Upper Sutlej Inundation Canals in the Lahore district, and half the fluctuating canal revenue on the Upper Sutlej Inundation Canals in the Montgomery district, the grantee shall enjoy the owner's rate for his life.

Explanation.—In the case of grants held by institutions the surrender of the owner's rate will be continued only during the life of the present head of the institution, if there is one, and if there is no such head, the term of settlement will be substituted for the life of the holder in applying this proviso.

Proviso II.—If, owing to supersession of irrigation from wells or other private works, by irrigation from Government canal, particular fields forming part of a jagír or máfi grant and assessed with land revenue at irrigation rates shall, at a settlement subsequent to the grant, be assessed at dry rates and made liable to a separate charge of the nature of owner's rate, then the grantee (if not also the proprietor or cultivator of the land) shall be entitled to compensation for the loss of the irrigated rate of land revenue which he formerly received on such fields. This compensation may take the form of an assignment of the whole or part of the owner's rate on such fields, or of a lump sum cash payment, or of a separate additional assignment of land revenue, as may seem most advisable in each case.

Proviso III.—This rule will not apply to the case of such assignees, if any, who are expressly entitled to owner's rate under the terms of their grants.

General Explanation I.—For the purpose of the above rules the term "owner's rate" includes water-advantage revenue, and the half of the fluctuating canal revenue on the Upper Sutlej Inundation Canals in Montgomery, which represents the revenue demanded at irrigated rates under the former system of assessment; and also the canal-advantage revenue rate assessable in the districts of Mooltan, Muzaffargarh and Dera Gházi Khan, on lands not assessed with land-revenue at canal irrigated rates at the late settlement, which may hereafter be supplied with canal water.

General Explanation II.—The term "grant" means each separate village or máfi plot, not a grant comprising several separate villages or several separate plots.

4. His Honor the Lieutenant-Governor strictly enjoins all Commissioners, Deputy Commissioners and Canal Officers to take due care that, in accordance with these rules, in the case of all new extension of canal irrigation to jagír and máfi lands the owner's rate shall in future be collected for the Government.

5. Under these rules, in certain cases, the revenue assignees will, for a time, or permanently, continue to receive owner's rates. In the districts irrigated from the Western Jumna Canal to which the owner's rate system has so far been extended, lists of the revenue grants have been prepared and orders passed as to the title of the assignees to the owner's rates. On the Agra Canal the irrigation is all of very recent date and the assignees are not entitled to the owner's rate. In the districts of Lahore, Montgomery, Gurdáspur and Amritsar, it will now be necessary to make out lists of all such Jagírdárs and Máfidárs as have been enjoying the water-advantage rate in Gurdáspur, Amritsar or Lahore, or half fluctuating revenue in Montgomery, by way either of assignment or exemption. In these lists, which should not include any other Jagírdárs or Máfidárs than those above noted, jagírs should be treated separately from máfis; and each jagír village or jagír share of village, and each máfi plot, must be separately shown. The Deputy Commissioners of the abovenamed districts should at once proceed to carefully prepare the required lists, and should then forward them to the Canal Officer, with a request that he will attest the fact that the revenue assignee has in practice been receiving the water-advantage rate, or half fluctuating revenue, by way of exemption or remission: when the lists have thus been attested, one copy will be kept in the Commissioner's office and one in that of the Deputy Commissioner: and thereafter whenever a Jagírdár or Máfidár entered in the list dies, it will be the duty of the Deputy Commissioner to at once enquire and report as to the class of those distinguished under the rules to which the deceased belonged; a separate misl will, in each case, be prepared, and the Deputy Commissioner after passing orders on the case will report them, through the Commissioner, to this office for

confirmation. Pending final orders on the case, the owner's rate will be collected and kept in deposit.

6. The Financial Commissioner desires that the Commissioners of Amritsar, Lahore and Mooltan will see that these lists are made out quickly and correctly, and will, on receiving their copies of the lists, forward them to this office for examination and return.

D.

General Rules in force on separate systems of Inundation Canals.

(a)—ON THE MOOLTAN SYSTEM.

IRRIGATION DEPARTMENT, PUNJAB.

Revised Rules for the Management of the Mooltan Canals.

Nature of the Canals.

1. The undermentioned canals of the Mooltan district, under the charge of the Executive Engineer, Lower Sutlej and Chenab Inundation Canals, are canals within the meaning of Act VIII. of 1873 :—

Sutlej Canals—	*Chenab Canals—*
Díwánwah Máilsi.	Mattíthal.
Jámwah Khurd.	Khádal.
Chattarwah.	Tahirpur.
Jámwah Kalán.	Daurána Langána.
Kábilwah.	Shahpur.
Sádikwah.	Wali Muhammad.
Baháwalwah.	Sikandarabad.
Sultánwah.	Gujjúhatta.
Abanwah.	Bukhtúwah.
Jamráníwah.	Dhundu.
Muhammadwah.	Sikandarwah.
Díwánwah Lodhrán.	Biluchanwah.
Shekhwah Sharkía.	
Mubárakwah.	
Khánwah.	
Shekhwah Gharbía.	
Háfizwah.	
Bahádurwah.	

Style of Canal Officers.

2. The Superintending Engineer of the Circle for the time being shall be the Superintending Canal Officer. The Executive Engineer of the Lower Sutlej and Chenab Inundation Canals shall be the Divisional Canal Officer, and the Assistant Engineers shall be the Sub-Divisional Canal Officers, as defined in Act VIII. of 1873, Section 3, item 7.

Establishment and its subordination.

3. All establishment employed on these canals shall be under the sole control of the Divisional Canal Officer, subject to his departmental superiors, and to such rules as may from time to time be issued by the Local Government in the Irrigation Department.

Clearance to be effected by *chher* labor.

4. In accordance with ancient custom, and by wish of the people, it is one of the conditions of settlements that the canal clearances shall be effected by labour supplied by the irrigators, and that in the event of non-attendance, a cash commutation shall be levied. The laborers provide their own tools, they are locally known as "*chhers*," and the cash commutation as "*Zar-i-nágha.*"

Commutation for labor.

The cash commutation for each day of non-attendance shall be, till further notice, 8 annas per man per diem, as heretofore.

5. There will be as heretofore one *Zar-i-nágha* Fund for all the canals of the district into which all receipts will be paid, and from which all expenditure will be made without regard to the income and expenditure for the time being of any particular canal.

The commutation fund and its uses.

The *Zar-i-nágha* Fund shall be devoted solely to assisting the *chher* laborers in clearing the canals, strengthening embankments, repairing breaches, cutting down spoil-banks, correcting the slopes of bad or alignment of the canals; in making escapes, building regulators, or digging new heads. It shall not be employed in extending the existing canals or in constructing new ones.

6. The Superintending Canal Officer shall, at the commencement of each official year, apply to the Local Government in the Irrigation Department to place at his and at the Divisional Canal Officer's disposal such sums as he may consider will probably be required during the year from the *Zar-i-nágha* Fund.

Sums spent from it to be sanctioned by the Local Government.

The allotments thus applied for having been granted, the Superintending and Divisional Canal Officers may sanction expenditure within those amounts. The limit of sanction for any particular work will be that prescribed in the Public Works Code Rules relating to expenditure from Revenue—Ordinary, for new works and repairs respectively.

7. A *Pancháyat* or Committee of non-official landholders will be appointed for each canal separately. It will consist of 9, 7, 5 or 3 members, according to the size of the canal.

Canal Committees.

The villages of each canal will be grouped in topographical circles or *chaks* according to their position on the canal. The number of *chaks* will correspond with the number of members in the *pancháyat* of that canal; one member being selected from each *chak*.

Irrigation Circles.

8. The members of each *pancháyat* will be appointed by the Divisional Canal Officer; they will be entirely under his control, and may be removed by him for negligence, incompetence, or misconduct. The Divisional Canal Officer shall record briefly in English and vernacular his reasons for any such removal. An appeal from his order shall lie to the Commissioner of the Division, whose decision shall be final.

Original appointment of Committee men.

Appeal shall lie to Commissioner.

9. In the case of all vacancies, from whatever cause arising, the new member to be appointed to the *pancháyat* shall be selected by the Divisional Canal Officer from the *chak* which the former member represented.

Subsequent appointment.

10. The duties of the *pancháyat* of a canal are—

Their duties.

(1) To assist the Divisional Canal Officer to distribute amongst the different villages the total number of *chhers* fixed for the canal, and to furnish the Divisional Canal Officer with these *mauzáwár* or village lists.

(2) To hear appeals from the *asámiwár* or individual distribution lists made on by the *lambardárs* or headmen of villages.

(3) To attend in person—to the extent of one-third of its members—during the clearances. The members thus present shall verify and sign the weekly lists of absentees, which shall then be submitted to the Divisional Canal Officer.

(4) To assist the Divisional Canal Officer with their advice on all matters regarding the management of the canals, especially as to the dates and places of employment of the *chhers*, and all questions connected with clearances, the use of *chháps*, &c., and the appointment and payment of the *mírábs*.

11. The opinion of the *pancháyat* on all points referred to them shall be reduced to writing, and when the Divisional Canal Officer [illegible]

Opinion of Committee to be in writing.

12. Each member of a *pancháyat*, who performs his duties to the satisfaction of the Divisional Canal Officer, will be entitled to have two *chhers* exempted from attendance out of the number due on his own holding.

Remuneration of Committee men.

The number thus exempted shall be deducted from the total number of *chhers* fixed for the canal.

This exemption may be cancelled by the Divisional Canal Officer in case of neglect of duty.

The orders of the Divisional Canal Officer in this matter shall be final.

13. The maximum number of *chher* laborers required to be in daily attendance during the clearances will be fixed for each canal by the Settlement Officer in concert with the Divisional Canal Officer.

Number of chher laborers required for each canals.

The number thus fixed will remain unaltered for five years, when, if necessary, it will be revised by the Deputy Commissioner (or, if a settlement is in progress, by the Settlement Officer) in concert with the Divisional Canal Officer.

Modification of the number.

The number thus fixed at each revision shall remain in force for periods of five years each, subject to the provisos contained in Rules 16 and 19.

14. The maximum number of *chhers* for each canal having been fixed as above, they will be distributed by the Divisional Canal Officer, assisted by the *pancháyat* and *lambardárs*, firstly amongst the several villages irrigating from the canal; and, secondly, inside the villages among all the occupiers of land who use canal-water.

Distribution of the work as represented by chher laborers.

The *pancháyat* will first prepare the *mauzáwár* lists showing the distribution amongst the different villages

By villages through the Committee men.

When these lists have been received and approved by the Divisional Canal Officer, he will call on the *lambardárs* to furnish *asámiwár* lists showing the names of the *chhers* to be called out in each village.

Inside villages through the headmen.

15. The distribution made (as in Rule 14) at the time of fixing the maximum number of *chhers* for each canal (Rule 13) shall remain unchanged until the next revision of the number, subject, however, to the general power of the Divisional Canal Officer to alter the distribution where such alteration may appear to him to be just and necessary.

Distribution to vary with number of chher laborers only, unless for special reasons.

Whenever alterations are necessary, the *mauzáwár* lists shall be submitted by the *pancháyat* to the Divisional Canal Officer on or before the 1st September, and the *asámiwár* lists shall be submitted to the Divisional Canal Officer by the *lambardárs* on or before the 15th October.

16. If any occupier gives written notice to the Divisional Canal Officer before the 1st September in any year of his intention to cease taking canal-water for any well or *patti*, on account of which he is assessed with *chher* labor, his name shall be struck out of the list in respect of such holding, and the number of *chhers* shall be to that extent diminished.

Relinquishment of water.

17. If, after having been so struck out, he shall in any subsequent year give notice in writing to the Divisional Canal Officer before the 1st September of his intention to again take water during the next year, his name shall be again brought on the *chher* list, and he shall be treated in all respects as if he had not resigned canal-water.

Renewal of taking water.

18. If, however, after having been struck out of the list as in Rule 16, he shall again take water in any year without having previously given notice, as in Rule 17, he shall be called on to pay a cash commutation (at the rate of eight annas a day for every day's labor at which such holding was previously assessed) for the last cold weather clearance, and shall, *as regards the future*, be again brought on the *chher* list on the same conditions as he was liable to before he resigned canal-water.

Penalty of taking water without renewal.

Taking of water on land hitherto unirrigated.

19. Similarly, occupiers of land whose holdings are not assessed with a share of the canal *jama* at the present revised settlement, and who may hereafter take water, shall be liable to the *chher* assessment (as in Rules 17 and 18, according as they have or have not given notice of their intention before the 1st September), as well as to the canal revenue, and all *chhers* so assessed will be in addition to the total number fixed for the canal at the previous revision, as prescribed in Rule 13.

Appeals against internal distribution.

20. All complaints against the *asámiwár* distribution of *chhers* shall be disposed of by the *pancháyat*, subject to an appeal to the Divisional Canal Officer, whose decision shall be final.

Appeals against village distribution.

All complaints against the *mauzáwár* distribution shall be heard by the Divisional Canal Officer in person, and all appeals from his orders in this matter shall lie to the Commissioner of the Division, whose decision shall be final.

Work of each chher laborer.

21. The full time for which the gangs of *chher* laborers shall be annually called out is fixed at 90 days, as heretofore.

A list of all occupiers whose labor assessment has been compulsorily commuted under this rule, and of all occupiers chargeable under Rules 18 and 19 with the amount due from each, shall be forwarded by the Divisional Canal Officers to the Deputy Commissioner before the 1st November in each year, and the amount due shall be collected by the Tahsildár with the land revenue on the 1st December, and credited to the *Zar-i-nágha* Fund.

All chher laborers to be called out.

22. *The total number of chhers* fixed for the canal (after deducting the exemptions allowed to the *panchayat* and the *chhers* from whom a fixed cash commutation has been taken under Rules 18, 19 and 21) shall *always* be called out for the clearances.

Date and place of work for each chher laborer to be fixed.

23. The Divisional Canal Officer, in consultation with the *pancháyat*, shall fix the date and place at which each *chher* is to present himself, and shall cause the *lambardár* of each village to be served with a written notice, showing such date and place, and the number of day's labor due by each man in his village. It will be the duty of the *lambardár* to affix this notice in a conspicuous part of the village; and, further, to draw the attention of the *chhers* to the information contained therein.

Absentees.

Any *chher* failing to be present at the place and on the date named in the notice shall be treated as an absentee.

Work to commence by 15th December.

The divisional Canal Officer will make such arrangements for calling out the *chhers*, that the clearance of the canals may, if possible, be commenced on the 15th December.

Weekly list of absentees.

24. A weekly list of all absentees will be sent to the Divisional Canal Officer by the *pancháyat* in attendance on the works, and a commutation fee of 8 annas a day will be levied from each absentee for each day of his absence.

Penalty of inefficient chher laborers.

25. When a Divisional or Sub-Divisional Canal Officer has satisfied himself by personal enquiry on the spot that any *chher* has been idle or insubordinate, he may pass a written order in the register of attendance, that one or more day's attendance of such *chher* shall count as non-attendance, and the commutation fee, as in the last rule, shall be levied for every such day.

Collection of fines of absentees.

26. A list of absentees, with the amount of commutation money due from each, will be sent by the Divisional Canal Officer to the Deputy Commissioner at the close of the season, and the amounts will be collected as an arrear of land revenue immediately on receipt of the list, and will be credited to the *Zar-i-nágha* Fund.

If work lasts over 90 days chher laborers to be paid.

27. The *chhers* will be kept at work until the clearances are completed; but if, in consequence of non-completion of the same, the *chhers* are retained at work beyond 90 days they must be paid daily wages from the *Zar-i-nágha*. The rate of wages shall be, until further notice, 6 annas per day.

If completed within 90 days, certain other works besides clearance may be exacted from the laborers.

If the clearances are completed within 90 days, the Divisional Canal Officer may employ the *chhers* on such works as are specified in Section 5. But none of these improvements are to be commenced until the clearance of the Canal has been completed; nor must they be continued after the 90 days have expired except on payment of the rate of wages fixed in Section 27.

List of laborers liable to call on emergencies.

28. In accordance with Section 64, Act VIII. of 1873 (Northern India Canal Act), and with Rule 64 of the Punjab rules issued under that Act, the Deputy Commissioner of Mooltan shall prepare and furnish to the Divisional Canal Officer a list of persons liable to supply laborers for employment in the event of any sudden emergency (as defined in Section 65 of the Act) arising during the non-working season.

Rate to be paid them till further notice.

On such an emergency arising, the Divisional Canal Officer is authorized to require any person named in the above list to furnish the quota of labor which, according to the list, he is liable to supply. The rate at which the laborers will be paid is hereby fixed, until further notice, at 6 annas a day; all such payments shall be chargeable to the *Zar-i-nágha* Fund.

Certain changes to be made only by Revenue and Canal Officers together.

29. No change in the old course of a canal, nor any permanent alteration in the irrigation, affecting in any way the payment of revenue as fixed at settlement, shall be made by the Divisional Canal Officer without consulting the Deputy Commissioner.

Lists to be furnished by Settlement Officer to Canal Officer.

30. The Settlement Officer shall furnish the Divisional Canal Officer with a list of the owners and occupiers of land recorded at the present settlement as taking canal-water and assessed with a share of the canal *jama*.

Remissions, suspensions, &c., to be made by Deputy Commissioner and Divisional Canal Officer in consultation.

Such list shall show for each person in detail for their separate holdings, known as wells and and *pattis*, the extent of his whole holding, and of its irrigated portion, and the amount of his canal and non-canal assessment. In all cases of proposed remission, suspension or redistribution of this canal assessment, as well as in all cases of proposed suspension of the commutation money payable by *chhers* for non-attendance, the Deputy Commissioner shall consult the Divisional Canal Officer.

Petition for remission of canal assessment to be filed by 15th September.

31. Any owner or occupier of a holding who claims a remission of any part of his canal land revenue assessment must present a written petition to the Deputy Commissioner either direct or through the Divisional Canal Officer by the 15th September at latest, after which no such petitions will be received.

The Divisional Canal Officer shall at once forward all petitions received by him to the Deputy Commissioner.

Procedure on petitions.

The Deputy Commissioner will be responsible for the prompt investigation of all such claims, and shall direct a local enquiry to be made and a report to be submitted by the Tahsildár or any officer subordinate to him whom he may select for the purpose. Whenever possible, the evidence of the Canal Darogha shall be taken by the officer making the local enquiry, and shall be filed with the record thereof.

On the receipt of the report whether the Deputy Commissioner considers that a remission of the canal assessment should be allowed or not, he shall forward the file, with a memo. of his opinion, to the Divisional Canal Officer for any remarks he may have to make. If the Divisional Canal Officer sees no reason to differ, he may return the file with a note to that effect.

If, however, from his knowledge of the working of the canals he is disposed to doubt the correctness of the acts reported, or of the Deputy Commissioner's conclusion, he may make any investigation he thinks necessary, and then return the files to the Deputy Commissioner, with a statement of opinion.

Upon receipt thereof, or after making such further enquiry as he may think the Divisional Canal Officer's opinion demands, the Deputy Commissioner will pass his final orders rejecting the the claim, or directing a proposal for remission to be entered in the annual statement to be submitted for the Financial Commissioner's sanction. After passing such final orders he shall send the file to the Divisional Canal Officer for information, and also shall duly inform that officer of any alteration in such orders which shall subsequently be made either by himself or by superior authority.

Deputy Commissioner may suspend collection of any part of canal land revenue assessment which he intends proposing for remission.

32. At any time after receipt of the report of the Tahsíldár or other officer making the local enquiry, the Deputy Commissioner may suspend the collection of any part of the canal land revenue assessment which he intends to propose for remission. Provided that he shall report all such suspensions to the Commissioner for confirmation within one month of the demand becoming due.

Registers to be maintained by Canal Officers.

33. A register (in Form I. attached) will be kept up by the Divisional Canal Officer, giving an abstract of the list received from the Settlement Officer (see Rule 30), and showing the irrigated area and canal *jama* for each village.

A register (in Form II. attached) will also be kept up by the Divisional Canal Officer showing for each canal the petitions presented to the Deputy Commissioner claiming remission on account of failure of canal-water and the orders passed.

FORM No. I.

Statement showing the Total of each Village.

Serial No.	Name of Village.	Hadbast No.	Canal jama.	Irrigated Area.		
				Flow.	Lift.	Total.

FORM No. II.

Statement showing Complaints received either direct or through the Deputy Commissioner regarding the failure of Canal water.

Name of Canal.	Name of Village.	No. of holding in statement received from Settlement Officer.	Name of owner or occupier.	Area recorded as irrigated.			Canal jama.	Grounds of complaint.	Orders passed.
				Flow.	Lift.	Total.			

Assessment of Chhers on the Sutlej Canals, 1880.

Diwanwah	400	Jamráníwah	70
Chattarwah...	100	Muhammadwah	350
Jamwáh Khurd	300	Sardárwah	600
Jamwáh Kalan	300	Shekhwah	175
Kabulwah	200	Bahawálwah	250
Sádikwah	40	Mubárakwah	200
Baháwalwah	270	Khanwah	100
Sultanwáh	250	Bahadurwah	30
Abanwah	100	Hafizwah	60
		Total Sutlej	3,795

Assessment of Chhers on the Chenab Canals, 1880.

Matithal	100	Gajju Hatta	175
Khádal	60	Bakhtúwah	240
Tahirpur	70	Dhandu	100
Daurána Langána...	100	Jalálpur Kháki	0
Shahpur	110	Pinjáni	50
Wali Muhammad	400	Sikandarwah	100
Sikandarabad	425	Belochánwála	30
		Total Chenab	1,960
		GRAND TOTAL	5,755

(*b*)—ON THE MUZAFFARGARH SYSTEM.

MUZAFFARGARH CANAL RULES.

WHEREAS, in accordance with certain provisions contained in the administration papers of certain villages situated in the district of Muzaffargarh, Government has authority from time to time to frame rules for the management and maintenance of certain irrigation works in that district, the following rules have been sanctioned by the Local Government:—

Definitions. The following canals of the Muzaffargarh district under the charge of the Executive Engineer, Muzaffargarh Division, are canals within the meaning of Act VIII. of 1873:—

Indus Canals.	*Chenab Canals.*
The Gharku.	The Karam.
„ Magassan.	„ Ganesh.
„ Maggi.	„ Taliri.
„ Adil.	„ Ghazanpur
„ Ghutthu.	„ Jhangawar.
„ Purán.	„ Ali Khali.
„ Suráb.	
„ Sulemán.	

Explanation. 1. In these rules the word "canal" means any of the above canals inclusive of its river supply channels and all its branches for the maintenance of which *chher* labor is leviable. It also includes all subsidiary works which are necessary to the protection of the irrigated land, or to the regulation of the water-supply, such as embankments, regulators, and escape channels. Where such subsidiary works are common to more than one canal, the demand for their maintenance may be apportioned among the said canals in such manner as the Deputy Commissioner deems fit.

2. The Superintending Engineer of the Circle for the time being shall be the Superintending Canal Officer: the Executive Engineer of the Muzaffargarh Division shall be the Divisional Canal Officer; and the Deputy Collector shall be the Sub-Divisional Canal Officer, as defined in Act VIII. of 1873, Section 3, item 7.

3. All establishment employed on these canals shall be under the control of the Divisional Canal Officer, subject to his departmental superiors, and to such rules as may from time to time be issued by the Local Government in the Irrigation Department.

4. In accordance with ancient custom, and by the wish of the people it is one of the conditions of settlement that the canals shall be maintained by "*chher*" *labor*, that is by labor supplied by the irrigators, and that in the event of non-attendance a cash commutation shall be levied. The laborers provide there own tools. They are locally known as "*chheras*," and the cash commutation as "*Zar-i-nágha*." The cash commutation for non-attendance shall, as at present, be eight annas per man per diem till further notice.

(NOTE.—In calculation of the amount of *chher* labor annually required for the clearances and of its distribution among irrigators, one *chher* means in Muzaffargarh the labor of one man for one day, not, as in Mooltan, the, labor of one man for the whole period of *chher* labor. The primary calculation is in fact made in single day's labor, not in 90 day's labor.

A *chher-guzár* means the person (whether owner or tenant) interested in the irrigation who by custom or agreement is in each instance liable to supply the *chher* labor.)

5. In the case of the Government canals divided into sections for purposes of local employment, but not for those of assessment, jurisdiction of committees, or other administrative arrangements, and which are detailed in Appendix I. of these rules, the *chheras* required from any branch of one section shall not be required to work on the branches of any other section, but they may be employed on any branch within the section from which they have been called out, and on any channels through which water is supplied to such section. Except as above provided, the *chheras* called out on any canal may be employed on any part of that canal.

6. There will be, as heretofore, one *Zar-i-nágha* Fund for all the canals of the district. Into this fund all receipts on account of the cash commutation and of sales of wood, grass and dates from date trees not assessed to land revenue from the canal banks shall be paid, and from it all expenditure will be made without regard to the income and expenditure for the time being of any particular canal.

The *Zar-i-nágha* Fund shall be devoted solely to the following purposes: first, it shall be ordinarily expended in assisting the *chher* laborers in clearing the canals, strengthening embankments, repairing breaches, cutting down spoil banks, correcting the slopes of beds or alignment of the canals, making escapes, and digging new heads; secondly, if the funds are sufficient, it may be expended in building regulators, making and maintaining plantations on the canal banks, and in the construction and maintenance of works to protect canals or canal land from river floods. It shall not be employed in making new canals or extensions of existing canals.

7. The Superintending Engineer shall at the commencement of each official year, apply to the Local Government, in the Irrigation Department, to place at his and at the Divisional Officer's disposal such sums as he may consider will probably be required during the year from the *Zar-i-nágha* Fund.

The allotments thus applied for having been granted, the Superintending and Divisional Officers may sanction expenditure within those amounts. The limit of sanction for any particular work shall be that prescribed in the Public Works Code rules relating to expenditure from revenue ordinary for new works and repairs respectively.

8. (i) There shall be appointed to each canal a committee of *sarpanches*, of which the numbers shall not be less than is stated below against each canal:—

Canal.	*Minimum number of Sarpanches.*
The Gharku	3
„ Magassan	8
„ Maggi	13
„ Adil	2
„ Ghutthu	7
„ Purán	6
„ Suráb	2
„ Sulemán	2
„ Kabir	...
„ Karam	2
„ Ganesh	2
„ Taliri	4
„ Ghazanpur	1
„ Jhangawar	2
„ Ali Khali	2

The minimum above stated may be revised from time to time under orders of the Chief Engineer of Irrigation.

(ii) The appointment of sarpanches shall rest with the Divisional Canal Officer and Deputy Commissioner acting jointly together. And in selecting men for these duties up to the minimum limit above fixed for each canal, the said officers shall follow (as nearly as may be) the procedure for the time in force for the appointment of revenue zaildárs.

(iii) On each canal the said officers may appoint, without taking the votes of village headmen, an additional number of sarpanches not exceeding half the minimum above stated.

(iv) No person shall be appointed a sarpanch under clause (ii) above, unless he holds not less than 100 acres of land irrigated by the canal to which he is appointed; nor shall any person be appointed under clause (iii) unless he holds at least half the said area. Nor shall any patwári or other person holding service under Government in the district be appointed.

(v) On the canals named in Appendix I., the Deputy Commissioner will decide how many of the sarpanches to be appointed under clause (i) of this rule shall be elected from each of the canal sections stated in the said Appendix; and the elections on those canals shall be by canal sections The sarpanches to be appointed under clause (iii) of this rule shall be similarly distributed over the sections of the said canals.

(vi) Differences of opinion arising between the Deputy Commissioner and Divisional Canal Officer under this rule shall be referred for the orders of the Commissioner, whose decision shall be final.

(vii) Every sarpanch's appointment under this rule shall be for five years, but his tenure of office may be extended, at the discretion of the Divisional Canal Officer, for a period not exceeding four years more. A sarpanch, whose tenure of office has expired, may be re-elected or re-appointed.

9. Canal sarpanches shall discharge their duties under the direction and control of the Divisional Canal Officer; and, with the concurrence of the Deputy Commissioner, may be removed by him for negligence, incompetence, or misconduct. The Divisional Canal Officer shall record briefly, in English and Vernacular, his reasons for such removal. An appeal from his orders shall lie to the Commissioner, whose order shall be final.

10. The duties of the members of the committee of a canal are :—

(i) To attend in person during the clearances in such numbers and order as the Divisional Canal Officer may direct. The members thus present shall verify and sign the daily lists of those present as heretofore, which shall then be submitted to the Divisional Canal Officer.

(ii) To assist the Divisional Canal Officer with their advice on all matters regarding the management of the canals, especially as to dates and places of employment of the *chher laborers* and all questions connected with clearances, the use of *chaps*, the distribution of water and the calling of the *chikar-chheras*.

(iii) To report to the Divisional Canal Officer all instances of neglect or misconduct on the part of the moharrirs and mirnhárs in the performance of their duties, and to assist in the appointment of these officers by bringing to notice the names of suitable and competent persons. The committee shall also possess a right to veto all first appointments to either of the above offices on satisfactory cause being shown.

(iv) The opinion of the committee on all points referred to it shall be reduced to writing, and when the Divisional Canal Officer overrules it, as he is hereby empowered to do, he shall record his reasons for so doing.

11. (1) Each member of a committee who performs his duties to the satisfaction of the Divisional Canal Officer will be entitled to have 180 *chheras* per annum exempted from attendance out of the number due on his own holding. The number thus exempted shall be deducted from the total number of *chheras* fixed for the canal.

(2) This exemption may be cancelled by the Divisional Canal Officer in case of neglect of duty, and the orders of the Divisional Canal Officer in this matter shall be final.

(3) No member of the committee shall be allowed a remission of a greater number of *chheras* than that at which he has actually been assessed.

Of the total *chher* assessment of each year, and the *chher* rate.

12. The number of *chheras* required on each canal for the clearances of each year shall be estimated in the month of September by the Divisional Canal Officer in the following manner :—

(i) He shall add up—

(*a*) the whole number of ordinary *chheras* who have actually worked on the canal during the three previous clearance seasons;

(*b*) the number of *chheras* remitted to sarpanches during the same time;

(*c*) the number of supplementary *chheras* employed on the canal under Rule (21) during the previous 36 months.

(ii) The total thus obtained he will divide by 3; and add to the result

(*a*) the number of *chikar-chheras* called out during the past hot weather;

(*b*) the number of *chheras* employed in watching the embankments connected with the canal during the previous hot weather.

(iii) The Divisional Canal Officer will then consider this corrected total (*ii*) in consultation with the committee of sarpanches, and he may reduce or enhance this total by a sum not exceeding one-fifth with reference to the then condition of the canal and the probable requirements of the working season. The sum so fixed will be the total *chher* assessment of the canal for the coming season.

(iv) Having thus arrived at the total *chher* assessment of the canal, the Divisional Canal Officer will add up the total acres irrigated by the canal during the three years ending with the previous rabi, and dividing this area by 3 he will assume the result to be the average area of irrigation.

(v) He will then divide the total *chher* assessment by the average area of irrigation, and declare the result to be the rate per acre irrigated chargeable for the coming season to each *chher-guzár*.

(NOTE.—In calculating the rate, fractions of units shall be stated in the nearest chitak.)

(vi) This *chher* rate shall be communicated by him through the tahsildár to each patwári concerned not later than the 10th October. And a list showing the *chher* rate declared for each canal shall at the same time be furnished to the Deputy Commissioner.

Of the distribution of the *chher* assessment on each holding.

13. (i) It shall be the duty of the Deputy Commissioner and his revenue establishment to distribute the total *chher* assessment thus declared for each canal over its *chher-guzárs* in the following manner :—

(ii) The distribution shall be reckoned on the area irrigated by canal water in the current kharíf and coming rabi.

(iii) For each irrigating village the patwári shall prepare in duplicate a list in the form (or other similar form prescribed for that purpose) given in Appendix II. of these rules, showing for each *chher-guzár* the area in respect of which he is liable to contribute *chher* labor during the coming season, and the total *chher* labor due thereon at the rate fixed by the Canal Officer.

(iv) One copy of this list shall be sent by the patwári to the tahsíldár not later than 1st December. And the tahsíldár shall immediately on receipt thereof forward it to the Divisional Canal Officer. The tahsíldár is responsible for the correctness of the lists thus forwarded by him.

(v) The patwári, when forwarding the said list to the tahsíldár, shall attach to it, for distribution to the *chher-guzárs*, under Rule 15, parchas duly written and filled up on forms supplied to him for this purpose by the Divisional Canal Officer.

Of complaints against the entries in the patwári's list.

14. (i) Any *chher-guzár* may demand from the patwári in advance of receipt of the Canal Officer's parcha a memorandum of the entries made by him in the *chher* list described in Rule 13.

(ii) A *chher-guzár* may complain to the tahsíldár or other revenue officer having jurisdiction that the irrigated area of his own or other holdings has been recorded incorrectly by the patwári.

(iii) The Deputy Commissioner shall issue from time to time such orders as are found necessary for the prompt disposal of such complaints by himself or the officers appointed by him in this behalf. And there shall be no appeal from the Deputy Commissioner's orders in such cases.

(iv) The complaints made under this rule may be supported by the patwári's memorandum (clause 1), or by exhibiting the Canal Officer's parcha (Rule 15), but the Canal Officer's parcha shall not in any case be taken out of the possession of the *chher-guzár*. Nor shall a complaint be refused hearing for want of these documents in support.

Of the distribution of assessment parchas to each *chher-guzár*.

15. On receipt of the patwári's list of *chher-guzárs*, as provided in Rule 13, the Divisional Canal Officers shall cause to be entered on the parchas accompanying the dates and places at which each *chher-guzár* is required to supply the labor assessed on him and shall distribute the said parchas to the *chher-guzárs* within 15 days of receipt of the list, either through the patwárís or as may be convenient.

16. The Divisional Canal Officer may, whenever practicable and with the consent of the Canal Committee, assign to the *chher-guzárs* on any canal or portion of a canal tasks or definite quantities of work to be done in lieu of the *chher* labor for which they have been assessed during the current season. Any *chher-guzár* failing to complete his task shall be liable to a fine not exceeding double the estimated cost of its completion, which will be paid into the *Zar-i-nágha*. The equivalent in taskwork for one *chher* laborer shall be determined by the Divisional Canal Officer in concert with the Canal Committee before the tasks are distributed.

17. (i) The dates and places for attendance of *chher* labor referred to in Rule 15 shall be fixed by the Canal Officer after consultation with the Canal Committee; provided that the clearances shall usually commence not later than 25th December.

(ii) The lambardárs of every irrigating village and the revenue zaildárs shall actively exert themselves to secure the attendance of the *chher* laborers at the places and on the dates entered in the parchas.

(iii) Every *chher-guzár* failing to supply labor at the places and on the dates mentioned in the parcha received by him from the Canal Officer shall be charged the commutation rate fixed under Rule 4.

18. (i) All *chheras* shall work under the control of the Divisional Canal Officer.

(ii) The Deputy Commissioner, and his assistants and tahsíldárs acting under his instructions, may inspect *chher* gangs, their work, and the attendance registers, and may during such inspections inquire into irregularities and complaints. The results of such inquiries shall be submitted to the Divisional Canal Officer.

19. A clear record shall be maintained of the men daily present, and shall be signed or sealed daily by the Committee-men in attendance on the work. A daily report shall also be sent to the Divisional Canal Officer, showing the number of men present on each canal.

20. When a Divisional or Sub-Divisional Canal Officer or a Revenue Officer, authorized under Rule 18, has satisfied himself by personal inquiry on the spot that any *chher* laborer has been idle or insubordinate, he may pass a written order in the register of attendance that one or more day's attendance of such *chher* laborer shall count as non-attendance, and the commutation fee, as in last rule, shall be levied for every such day. *The members of the Committee present at the clearances may pass a similar order, provided it is clearly reported in the register and signed or sealed by all the members present, being not less than two.*

21. A list showing the commutation money due from each *chher-guzár* on account of absentees shall be sent by the Divisional Canal Officer to the Deputy Commissioner at the close of each clearance season, and the amounts charged thereon shall be collected as an arrear of land-revenue, with the first instalment of the rabi harvest and shall be credited to the *Zar-i-nágha* Fund.

22. If the *chher* work of the year on any canal or section is completed before all the *chher* labor has been employed, the Deputy Commissioner, after consulting the Divisional Canal Officer, may remit the balance of the *chher* demand of that canal or section. Such remission will not be taken into account in reckoning the average on which future assessments will be based.

23. (i) If the *chheras* assessed under Rule 12 are unable to complete on any canal the work of the season, a supplementary levy (locally known as "four-anna *chhers*") can be made with the sanction of the Deputy Commissioner, and shall be declared in the form of a proportional addition to the demand fixed under Rule 13.

(ii) A daily wage of four annas shall be paid from the *Zar-i-nágha* Fund to every laborer who works on the canal pursuant to this demand.

(iii) Such laborers shall be subject to the same control; and the same penalty for non-attendance shall be leviable as is provided by these rules for *chheras* assessed under Rule 12.

24. (i) Every canal-irrigated village shall be liable to supply, on demand by the Divisional Canal Officer, special or "hot weather" *chheras* (locally known as *chikar-chheras*) during the irrigating season or after the clearances are completed.

(ii) *Chikar-chheras* may be called out for any of the following purposes:—

Strengthening or cutting through bunds for maintaining the supply in the canals, opening or clearing alternative heads when necessary to maintain the supply, closing breaches in the canal banks, clearance of escape or drainage lines, repairs and maintenance of the flood embankments protecting canal-irrigated land.

(iii) *Chikar-chhers* shall be levied with such regard to the convenience of the whole body of irrigators as the urgency of each case may require. And the Canal Officer will consult the Deputy Commissioner and the Canal Committee, so far as may be possible, with reference to the same urgency.

(iv) No *chher-guzár* may refuse to supply *chikar-chheras* on the ground that the demand made on it exceeds his proportional share. But in levying during the following cold season the demand assessed under Rule 13, the Divisional Canal Officer shall give credit to each *chher-guzár* for any *chheras* supplied

by him under this rule; the said credit being given by endorsement on the canal parchas before issue (Rule 15).

(v) No wages shall be payable to *chikar-chheras*.

(vi) *Chikar-chheras* shall be subject to the same control, and the same penalty shall be leviable for non-attendance as is provided by these rules for *chheras* assessed under Rule 12.

(vii) The appended statement (Appendix III) shows for each canal the lengths of existing embankments and escapes or drainage lines for which *chikar-chheras* may be called out. This list will be modified from time to time with the sanction of the Deputy Commissioner and Chief Engineer of Irrigation as the circumstances of each canal may require.

25. The Divisional Canal Officer may during the hot weather require any irrigating village to supply men to watch embankments connected with its canal; and the provisions of clauses (iii) to (vii) of the preceding rule shall apply to all such demands.

26. No change in the old course of a canal, nor any permanent alteration in the irrigation affecting in any way the payment of revenue as fixed at settlement, shall be made by the Divisional Canal Officer without consulting the Deputy Commissioner.

27. (i) Any owner or occupier of a holding who claims a remission of any part of his canal land-revenue assessment must present a written petition to the Deputy Commissioner by the 15th September at latest, after which no such petitions shall be received.

(ii) The Deputy Commissioner will be responsible for the prompt investigation of all such claims, and shall direct a local inquiry to be made and a report submitted by the tahsíldár or other officer subordinate to himself whom he may select for the purpose.

(iii) Whenever possible the evidence of the canal subordinate in immediate charge of the canal concerned shall be taken by the officer making the local inquiry, and shall be filed with the record thereof.

(iv) On receipt of the report, whether the Deputy Commissioner considers that a remission of the canal assessment should be allowed or not, he shall forward the file, with a memo. of his opinion, to the Divisional Canal Officer for any remarks he may have to make.

(v) If the Divisional Canal Officer sees no reason to differ, he shall return the file with a note to that effect. If, however, from his knowledge of the working of the canals he is disposed to doubt the correctness of the facts reported, or of the Deputy Commissioner's conclusion, he may make any investigation he thinks necessary, and then return the file; to the Deputy Commissioner with a statement of opinion.

(vi) On receipt of the Canal Officer's reply, or after making such further enquiry as he may think fit, the Deputy Commissioner will pass his final orders rejecting the claim or directing a proposal for remission to be entered in the annual statement to be submitted for the Financial Commissioner's sanction.

(vii) The Canal Officer shall be informed of the order thus passed, and of any others subsequently received from superior authority.

(viii) In all such cases the Deputy Commissioner may suspend the collection of any demand for canal revenue that may fall due before the procedure above laid down can be completed. Such suspension orders will be subject to the same rules in respect of sanction and control of the Commissioner as are provided for the suspension of land-revenue. And notice of all such orders shall be given to the Divisional Canal Officer.

28. Any *chher-guzár* on whom commutation money has been assessed under these rules may apply to the Deputy Commissioner for its remission or suspension. Such petitions shall be referred to the Divisional Canal Officer for inquiry and report. And final orders there[illegible]

Commissioner after receipt of that report and after such further inquiry by the Deputy Commissioner as each case may require. But so far as the Deputy Commissioner's decision depends on the question of attendance or non-attendance of *chher* laborers, he shall be guided by the facts found by the Canal Officer.

29. Before water is given to a village previously unirrigated by any canal, the Divisional Canal Officer shall take an agreement in writing from the village to abide jointly and severally by the provisions of these rules and of any others for the time being in force; and also to pay water-advantage on newly-irrigated land according to the conditions prescribed at settlement in villages adjacent. And such agreement shall further stipulate that if the village or any of its irrigators shall make default in respect of the matters entered therein the Canal Officer shall have authority either to stop the supply of water or to levy a canal occupier's rate, within the meaning of Section 36, Act VIII. of 1873.

APPENDIX I.

CANALS DIVIDED INTO SECTIONS FOR THE PURPOSES OF RULE 5.

Explanation.—The entries in column 3 include minor branches and alterations of existing channels.

1	2	3
Name of Canal.	Section.	Branches included in each section.
Gharku	1st Section	Kot Sultan Feeder. Hinjrai. Dín Muhammad. Dhori.
	2nd Section	Radha. Nangni. Wali. Khan Chand. Panjhatti. Fazl. Otani. Mohan.
Magassan	1st Section	Chaudri. Nangni. Nari. Dol. Sirmunni. Kesho. Ganda Bhubbar. Sahju. Soni. Ganda Pirhar. Hala. Pirhar. Raju. Karia Chaudri. Khakki. Nabi.
	2nd Section...	Murad. Sirdar. Karia Sananwan. Karia Tej Bhan. Karia Gaman Khan. Muhammadpuri. Khanpuri. Nangni Khurd. Lar Janubi. Nangni Kalan.
	3rd Section	Jan Muhammad. Pir. Hamza. Dogri. Chakar Khan. Karia Khakh. Karia Tibbi Nizam. Chúan. Ghulam.
Maggi...	1st Section	Khudadad. Lishari. Bulla. Sultan Khar. Fazil Kalru.
	2nd Section	Suk Main Branch. Kot. Karia Khohawar. Karia Gordhan. Wairar. Kori.

APPENDIX I.—*concluded.*

1	2	3
Name of Canal.	Section.	Branches included in each section.
Maggi (*concluded.*)	2nd Section (*concluded.*) ...	Haji Ishak. akhri. Thal. Bahawal. Gahne. San. Karia Nusrat. Sirdar.
	3rd Section	Dinga Main Branch. Sirdar Khurd. Kalu.* Sirdar Kalan. Nang. Chatli. Karkna.
Ghuttu	1st Section...	Pir. Raj. Rehri. Behishti. Bakht. Azím. Darni. Kalan Shah. Hamarwala.
	2nd Section...	Sirdar. Khandar. Ahmad Shah. Moradpori. Kirarn. Ghilu. Ghulam.
Purán	1st Section	Bakkhi.
	2nd Section	Kapra Khas. Khanana. Nimana. Kutab. Murad Shah. Said. Bhagti. Chandr Bhan.
	3rd Section...	Lunda (North). Lunda (South). Sabaya. Pir. Kadra. Bahawal. Khan.

*Includes extension to Wali.

APPENDIX II.

PATWARI'S LIST OF CHHER-GUZARS.

Referred to in Rule 13.

1	2	3	4	5	6	7	8	9	10
			Irrigated Area.						
Serial No. in this List.	Name of Canal and Branch.	*Chher Guzár.*	Harvest.	Girdáwari No. of holdings irrigated.	Area of each harvest.	Area of both harvests.	Divisional Canal Officer's *chher* rate per acre.	*Chheras* due.	Remarks.
			Rabi						
			Kharif						
			Rabi						
			Kharif						

APPENDIX III.

Statement showing lengths of existing flood-protective embankments, escape channels, and canal bunds, and the villages and canals liable for the repairs and maintenance of each, referred to in Rule 23.

1	2	3
Name of Work.	Length.	Canals or villages liable to supply *chhers* for maintenance and repairs.
Flood protective Embankments.		
Sanawan	24 miles ...	Gharku and Magassán.
Shekhánwála	1½ " ...	Kot and Isbák branches of the Suk main branch of Maggi.
Aráin	4 " ...	San, branch of Suk main branch, Sirdár Khurd and Kála branches of Dinga main branch. } Maggi.
Kinjhar and Mahra ...	8½ " ...	Pír and Ráj branches of Ghuttu and Adil Canals.
Púran	1½ " ...	Púran.
Kot Ratta from north end to 1st or Múradghát or Gap.	...	Villages on west bank of Suráb.
Kot Ratta from Múrádghát or Gap to Sulemán Canal.	12,800 s. ft....	As this length does not at present protect canal irrigation, Deputy Commissioner has verbally consented to arrange for its maintenance temporarily by the people who benefit from the *sailáb* permitted through the Gaps.
Langar Sárai	8,200 " ...	Ganesh, above provincial road.
Khillúwála...	1½ miles ...	Taliri, above provincial road.
Wafadárpur	3 " ...	The villages protected.
Khángarh Kothela ...	8 " ...	Ditto ditto.
Makhan Bela	7 (about) miles	Ali Kháli Canal and a few other villages protected.
Escapes or drain, Rohilliánwála. Section above Panjihar bridge.	10 miles ...	The Chenab Canals.
Rohillíanwála. Section below Panjihar bridge receiving drainage from Wali or Scinde Escape.	10 " ...	The Chenab Canals and branches of the Ghuttu, excluding the Sirdár and Ghilu.
Scinde (or Wali extension). Section between Kalú and Sirdár Dinga.	7 " ...	Dinga main branch of the Maggi and its branches.
Scinde (or Wali extension) Section between Sirdár Dinga and Panjihar bridge.	9 " ...	Adil Canal, Pír and Rája branches of Ghuttu.
Bunds to maintain supply in certain Canals.		
Bet Angra	...	Maintenance not at present necessary.
Lassuri	...	Dinga main branch of Maggi and its branches.
Chittah	...	Adil Canal.
Sirdár Ghuttu	...	Sirdár branch of the Ghuttu.

(C.) On the Dera Ghazi Khan System.

IRRIGATION DEPARTMENT, PUNJAB.

Orders and Procedure for the Administration of the Canals in Dera Ghâzi Khan, drawn up by Captain Broadfoot, R.E., *Assistant Secretary to Government, and approved by His Honor the Lieutenant-Governor.*

The Canal Act, VIII. of 1873, will be applicable to these canals; provision being made in the rules under the Act for the appeal under Sections 32*b.*, 33 and 34 to lie to the Deputy Commissioner instead of to the Commissioner, owing to the special circumstances of the Dera Ghâzi Khan district.

The entire expenses of the maintenance of the Main Canals will be defrayed by Government; and those portions of the Branches and Distributaries which are entered in the register of rights of irrigation recorded at Settlement as maintained wholly or in part at Government expense, will continue to be so maintained to the extent recorded at Settlement.

The canals are—

(1) Mánkah.	(6) Chibbri.	(10) Núr.
(2) Kot Dáúd.	(7) Sáhibah.	(11) Dhundi.
(3) Shoriah.	(8) Gámúnwálah.	(12) Rutab.
(4) Kastúri.	(9) Sohán.	(13) Kádrah.
(5) Dhingánah.		

For detailed list showing the canals and branches, see Appendix A.

The executive management, including distribution of water, will be under the sole control of the Canal Officers. Priority of claim to water, as laid down in the revised Settlement records (copies of which will be furnished to the Canal Officer), to be attended to in making the distribution.

The income to be credited to the canals to be, *viz.* :—

(*a*) Two-thirds of the land revenue assessed on lands irrigated by both canals and wells (*cháhi, nahri*).

(*b*) The whole of the land revenue assessed on the lands known as "banjari" irrigated by the canals.

(*c*) Rs. 54,000 per annum, exclusive of collection or other charges, subject to reconsideration after five years in lieu of the half clearance rate formerly levied. This is to be levied over and above the land revenue.

(*d*) To provide for certain contingencies which may happen during the term of settlement—

(i) In the case of a new canal made by Government, occupier's and owner's rates would be leviable, as on other Government canals elsewhere, in addition to receiving credit in accounts for such part of the land revenue as may be determined when the case arises.

(ii) Should an existing canal be enlarged or increased by Government, so as to deliver a greater volume of water, and irrigation consequently extended, the newly irrigated land would be assessed at irrigated rates of land revenue. For the cost of clearance of additional channels special arrangements must be made with the parties interested. Should the area of newly irrigated lands consequent on the increased supply in the canal not exceed 10 per centum on the irrigated area in the village as recorded at the late settlement, no additional demand will be made on this account, unless when special arrangements are made between the villagers and the Canal Department, to the effect that the former agree to pay for the increased irrigation at irrigated rates.

(iii) No additional revenue will be assessed on newly irrigated land when the water is supplied from a canal not increased by Government, if the land is situated in a village partly irrigated at the time of settlement; but if the land is situated in a village wholly unirrigated at that time, the irrigated lands will be assessed at irrigated rates of land revenue.

(iv) If water-courses which have hitherto been maintained by the irrigators fall into disuse or disrepair, requiring clearing, repairing or enlarging, or where (disputes having arisen regarding the quotas of labor to be furnished by the different shareholders, or from other reasons) the irrigators may wish Government to undertake the maintenance, then the irrigated lands would be subject to the conditions of clause (*d*) (ii).

Should any case under clause (*d*) arise, Superintending Engineer is directed to report the matter to the Local Government for orders.

V. Measurements of the irrigated lands to be made as at present for statistical purposes, by the Canal Department through the Village Patwárís if qualified, among whom the sum now expended on separate measuring parties will be distributed as an additional allowance, provided that the work has been performed by them.

Procedure.

1. A statement of the demand, under Rule IV (*a*) and (*b*) will be furnished to the Canal Officer by the Deputy Commissioner yearly, not later than the 20th March of each year.

2. Remissions will be of two kinds: those on account of failure of canal-supply, and those on other accounts; regarding the former, the Canal Department will be referred to; but, as in both the remission is from land revenue, the procedure obtaining for such will be followed. The Deputy Commissioner will furnish the Canal Officer with a statement of remissions.

3. Rupees 54,000 (Rule IV (*c*), will be assessed in the Civil Department. It will be collected with the kharíf instalment, and should be credited on the 15th March in each year. Intimation of this will be furnished by the Deputy Commissioner to the Canal Executive Engineer.

4. When the Patwárís are capable of conducting the measurements, the Canal Officer will employ them instead of the Amíns now used. The Deputy Commissioner will inform the Canal Officer what Patwárís he thinks to be capable of performing this duty. The Canal Officer will try such; and should they fail, the procedure described in the eighth rule will be followed. Should the Patwári be unable to attend, from sickness or other unavoidable cause, he may be allowed to furnish a substitute.

5 The Canal Officer will give the Deputy Commissioner three weeks' notice before he requires the attendance of the Patwári.

6. The District Officer will, on application from the Canal Officer, place the services of the Patwári at his disposal, and issue such orders to the Patwári as will ensure his prompt attendance on the Canal Officer.

N.B.—The number of Patwárís required will be the same as the number of Patwárí Circles, in which there is irrigation from channels under the Canal Department. Each Patwári should be held responsible for the measurements in his own circle, thereby maintaining the advantages of local knowledge and defined responsibility. The Deputy Commissioner shall ordinarily, and except when another date may be agreed on in consultation with the Executive Engineer, and confirmed by the Superintending Engineer, place the services of the Patwárís at the disposal of the Executive Engineer on the 15th of August in each year. It will not, in all probability, be necessary to chain each field every year.

7. Payment to the Patwári of his additional fees from the money supplied by the Canal Department will be conditional on his producing a certificate from the Canal Officer, to the effect that the measurements have been satisfactorily made. The Executive Engineer may recommend specially good Patwárís for extra allowances.

8. Should the Patwári fail to complete the measurements with which he is entrusted, the Canal Executive Engineer is empowered to employ and pay a substitute; the cost thus incurred is to be defrayed from the emoluments of the Patwári in fault.

9. The necessary establishment of chainmen required to make the measurements under the direction of the Patwári will be estimated for in the usual way, and sanctioned by the Local Government on application from the Superintending Engineer.

10. The sum of Rs. 3,000 will be annually paid by the Canal Department to the Civil Department to be distributed among the Patwárís as an additional allowance, subject to such rules and conditions as the Financial Commissioner may prescribe.

Superintending Engineer will therefore include this sum in his Budget-Estimate.

11. The Controller, Public Works Accounts, will furnish to the Joint-Secretary's office annually, a statement showing the half cost of clearance under the heads detailed in para. 11 of Local Government Resolution No. 18, dated 2nd January 1874, *viz.* :—

(1) Half the cost of excavation;

(2) Half the cost of establishment employed in supervising the work;

(3) Half cost of repairs to banks;

(4) Whole cost of establishment employed in distribution;

(5) Half cost of establishment employed in measuring the area irrigated.

APPENDIX A.

DERA GHAZI KHAN DIVISION INDUS CANALS.

Statement showing Canals and Branches, prepared from Settlement Officer's Statement.

No.	No. of Canal.	Name of Canal.	Names of Branches or Water-courses.	Length in miles.	REMARKS.
1	1	Mánkah ...	Bája ...	12	Cleared by Government.
2	2	Do. ...	Dhori ...	...	„ by Zamíndárs.
3	3	Do. ...	Lundah ...	...	„ by Government.
4	1	Kuf Dáúd ...	Hambi ...	...	This and all other Branches are cleared by Zamíndárs.
5	1	Shoriah ...	Vang ...	14	Cleared by Government.
6	2	Do. ...	Keria Kaúr ...	5	„ „
7	1	Kastúri ...	Khán Díwán ...	5	„ „
8	2	Do. ...	Allah Dád ...	5	„ „
9	2	Dhingánah ...	Ráj ...	6	„ „
10		Do. ...	Behár ...	4	„ „
11		Do. ...	Bhúra Wahi ...	2	„ „
12	[illegible]	Do. ...	Núr ...	6	„ „
13	5	Do. ..	Samundri ...	15	„ „
14	1	Chibri ...	Ránjah ...	5	„ „
15	2	Do. ...	Punár ...	9	„ „
16	1	Sáhibah ...	Bunqna ...	16	„ „
17	1	Gámunwálah ...	Ráziwálah ...	...	„ by Zamíndárs.
18	2	Do. ...	Yúsa ...	...	„ „
19	1	Sohan ...	Háshim ...	10	„ by Government.
20	2	Do. ...	Pháría ...	8	„ „
21	1	Núr ...	Muhammad ...	6	„ „
22	2	Do. ...	Islám ..	15	„ „
23	3	Do. ...	Músa ...	...	„ by Zamíndárs in 1870
24	4	Do. ...	Lundah ...	...	„ „
25	5	Do. ...	Hazúri ...	...	„ „
26	6	Do. ...	Lachah ..	...	„ „
27	7	Do. ...	Burkúndár ...	...	„ „
28	8	Do. ...	Bhishti ...	...	„ „
29	1	Dhundi ...	Mobárik ...	2	„ by Government.
30	2	Do. ...	Bhishti, 2nd ...	...	„ by Zamíndárs.
31	1	Kutab ...	Fázal ...	7	„ by Government.
32	2	Do. ...	Lundah ...	7	„ „
33	3	Do. ...	Kálu ...	4	„ „
34	4	Do. ...	Mobárik ...	8	„ „
35	5	Do. ...	Chátul ..	3	„ „
36	6	Do. ...	Hazúri, 1st ...	4	„ „
37	7	Do. ...	Do., 2nd ...	...	„ by Zamíndárs.
38	8	Do. ...	Ráj ...	3	„ by Government.
39	1	Kádrah ...	Ghúti ...	6	„ „
40	2	Do. ...	Gymal, new ...	5	„ „
41	3	Do. ...	Pahár ...	2	„ „
42	4	Do. ...	Bhágsari ...	10	„ „
43	5	Do. ...	Hamíd ...	4	„ „
44	6	Do. ...	Qázi ...	4	„ by Zamíndárs.
45	7	Do. ...	Gymal, old ...	...	„ by Government.
46	1	Mahmúd ...	...	...	„ by Zamíndárs.

E.

Extract from the Mannual of Canal Revenue Administration by Major Ottley, showing general nature of the Canal Officer's duties.

Manual of Canal Revenue Administration compiled for the use of Officers on the Sone Canals by Lieutenant J. W. Ottley, R.E., Executive Engineer and Assistant to Chief Engineer, Bengal, P. W. Dept., Irrigation Branch, 1873.

"The principle which I conceive to underlie all thoroughly successful administration is this, that the Agency employed should be truly competent to perform the duties expected of it, and that there should be a controlling authority completely responsible for the proper performance of the whole of those duties. In proportion, as we approach or recede from this standard, will it be found that administrative action is successful or otherwise."

In 1867, Colonel Strachey, R.E., then Inspector-General of Irrigation Works, was deputed to all the more important localities in India where irrigation was practised, with a view to reporting upon all matters connected with the works and systems of management. On his return he reported to the Government of India as follows :—

* * * * *

"Confining ourselves for the present to that class of works which would properly fall under the full control of Government Officers, and excluding the minor works, the construction or maintenance of which, either on account of their simplicity or their intrinsic small importance, may be better left in the hands of the cultivators themselves, it will be apparent that the duties to be performed may be classed under the three following heads :—

1st,—Construction and maintenance of works.

2nd,—Management and distribution of water-supply.

3rd,—Fiscal Administration.

"No serious question is now likely to arise regarding the agents who should carry out the first class of duties. In their nature they must obviously be performed by professional Engineers, if they are to be properly performed. * * * The second branch of duties is that connected with the management of the water-supply. It has before been stated that in Upper India these duties are exclusively in the hands of the Canal Engineers; that in the last constructed works at Madras the Engineers exercise a control over the water-supply and distribution almost as complete; while in the older works, such as those in Tanjore, the management is exclusively in the hands of the Revenue Officers. The questions then arise, which of these systems is the best; and is there any sufficient reason for adopting the one system in one place, and the other in another? Is it expedient to maintain the old system such as prevails in parts of Madras, Mysore and Bombay, under which the management of Irrigation Works is virtually in the hands of the District Revenue Officers, the Engineers only intervening, when called upon to do so, to execute repairs, or to correct obvious defects; or should this business be transferred to the Irrigation Engineers?

"The positive arguments in favour of a professional management are that, for the economical and certain distribution of water in prescribed proportions to different localities, Engineering skill is absolutely needed; that this skill is equally requisite to admit of trustworthy opinions being formed as to the sufficiency of the water-supply, the causes of deficiencies, and the best way of preventing or remedying them; the possibility of extending the use of the available volume of water, and the means of accomplishing this; the manner of dealing with the drainage of the irrigated lands and utilizing to the utmost the surplus waters passing from them or the irrigating channels; the decision of disputes among consumers of water as to the shares to which they are equitably entitled, and the quantities they actually receive. In fact, it may be said that among all the steps that have to be taken in relation to the supply of the water and its distribution, there is not a single one which does not call for professional knowledge. The properly qualified Canal Engineer has this knowledge; the Revenue Officer is, as a rule, wholly devoid of it, and it may be safely said that no knowledge of the sort in question which he will possess will be of sensible value. As a fact, when there is a non-professional management, the whole of the matters abovementioned are entirely neglected until the evils caused by such

neglect become so serious as to lead to an Engineer being called in to apply a remedy. Nor does this complete what has to be said on the subject. In truth, the full benefit of Engineering skill and knowledge can never be applied to the construction and maintenance of the works unless the Engineers are constantly watching their operation, and have an intimate acquaintance with all their peculiarities, and the precise wants which they are to supply. Not only is professional knowledge necessary to secure the best management, but a complete practical knowledge of the details of management is necessary to secure the most satisfactory application of professional skill to the works. To know how best to design and construct his works, the Engineer must know how they are used; and to know how best to use the works, the managing Officers must have Engineering knowledge. The conclusion seems unavoidable that the Engineers should have the management of Irrigation. * * * I believe that there is one thing only which leads with certainty to success and progress, and that is knowledge that there is no condition of affairs in which improvements of great value may not be made by the help of increased knowledge; and that of all places in the world where such improvements may most reasonably be hoped for, India stands very prominently forward. I reject the doctrine that Revenue Officers, avowedly quite devoid all the special knowledge which is required for anything but an empirical management of the supply and distribution of water, are proper persons to be left in charge of such a duty one day after it becomes possible to replace them by persons possessed of such knowledge. I dispute the position that, under a reasonable system, professional Engineers would be one whit less capable of dealing justly with established rights to water-supply than the District Revenue Officers, or less careful of the interests of the community and of the public revenue dependent on the efficiency of the irrigation, or less able to command respect and co-operation from the people of the country in which the works lie. On all these points we have direct evidence, obtained from actual experience in Upper India, that professional Engineers are to be trusted quite as fully as Revenue Officers; and on general grounds it may safely be predicated of the professional Officers that, inasmuch as their exact knowledge of the things to be done will necessarily be more complete, those things will be better and not worse done by them. With no less confidence do I assert that great and valuable improvements may without the smallest doubt be made in the Irrigation Works of all parts of India, and that the scope and necessity for improvement is especially great precisely where the non-professional system of management has till now been followed. As to questions of law, rights and customs, so far as these really affect the management of irrigation, I can conceive no reason why they should not be as well understood by a specially trained class of Engineers as by the Revenue Officers. * * * So much as to the necessity for placing the management of the water-supply of Irrigation Works under a special professional department, to the exclusion of the ordinary Revenue Officers. I now have to refer to the third class of duties, those connected with system of fiscal administration, and the supervision of the assessment of the charges for the use of the water and the collection of the revenues.

"One of the questions which has often been discussed in comparing the relative merits of the Irrigation System of Southern and Northern India, is the proper position of the Canal Engineer in relation to the realization of the canal revenues. As was before stated, the Madras system gives the Engineer no concern whatever in the revenue; that of the North-West makes him exclusively and entirely responsible for the assessment and determination of the payments, leaving to the District Revenue Officers the simple duty of receiving the actual payments. I have already briefly explained how these different systems arose. I have before implied that both these systems appear to me to err; the former in excluding the Engineer from all concern in the revenue; the latter in throwing the fiscal duties too much upon him. There would seem to be a possible medium between them, which should secure the advantages now claimed by the supporters of both systems. The advocates of the North-West system allege that, as the Engineer has the full control of the distribution of the water, he will know best what should be charged for its use in every case, and will best be able to

*This was written in 1868, prior to the opening of the large Irrigation Works in Bengal. A description of the system in force there will be found further on.—J. W. O.

ensure the just claims of the State being established and realized. The Madras argument is, that the Engineer's time should not be occupied with other duties than those which are truly professional, and that the fiscal arrangements can quite well enough be carried out by the ordinary Revenue Officers. There can, it seems to me, be no doubt that if the Canal Engineer be the Officer responsible for the distribution of the water, his duty should extent at least so far as to see that the demands for payments are in the aggregate properly made. * * * In these matters there is room for some variation of practice. So far as the ordinary land revenue is affected by irrigation, certainly the ordinary District Revenue Officers will continue to be the proper authorities to deal with it, and this must also apply to cases where, as in Madras, there is a consolidated assessment. Where a special water-rate is levied, it seems most probable that the assessment and fiscal management would better be made under separate Officers acting independently of, but in close communication with, the Engineers in charge of the works and distribution of the water. In all cases, however, it appears to me essential that one superior authority should control the whole of the fiscal arrangements, the management of the irrigation, and the Engineering duties proper."

* * * * * * *

As regards the desirability of entrusting the following classes of work to Canal Engineers :—

(*a*) The decision of disputes among consumers of water;

(*b*) The cognizance of complaints regarding a deficiency or total deprivation of water-supply.

(*c*) The cognizance of complaints regarding incorrect measurements and charges.

Colonel Greathed writes thus ;—" In respect of class (*a*), the people who can best judge are those who make the original appointment of distribution of water, and who have practical experience of its resulting effects, that is to say, the Canal Officers ; and as between one consumer and another they are, it is needless to say, perfectly disinterested and impartial. The decision of (*b*) cases requires technical, if not professional, knowledge, because it is first necessary to investigate the *causes* of failure, and none but an expert can pronounce if bad results are due to really short supply or to neglect of cultivators.

" It is held as a principle, and justly so, that whoever irrigates a field more than once in a "fasl" must pay water-rate be the outturn what it may, unless he can prove that short supply and consequent failure of crop resulted from causes beyond his control. Were it otherwise, questions of degree of irrigation would be endless. As it stands, people who have lost their crops from actual scant supply or from some overwhelming calamity obtain remission ; otherwise they do not. Water-rate is low in comparison to the value of water, and those who irrigate take all but extreme risks.

" But to investigate properly a case of dried-up crops, it is often necessary to examine not only the field, but the state of the water-course which irrigates it; the distributary which supplies the water-course; the guage reports for three or four months back, which show the height of water in the channel of the distributary ; the daily reports of the period, which should record any breach in a Government water-course, or any interruption to irrigation. It may be further requisite to compare the state of the field which failed with that of others in the neighbourhood which had similar opportunities ; and to make considerable local enquiry as to the appearance and condition of crops before the alleged failure of water, the quality of seed sown, and so on.

" The investigation, in short, must be made on the spot ; and it will be better made by a Canal Officer, resident on the canal and conversant with the details of the subject, than it could be by an Assistant Collector, unfamiliar with the details, who could hardly carry out such local enquiry at a distance from his station, save in accidental cases which he came upon in his cold weather tour. Such intermittent action would not answer any useful purpose : this business must be carried out continuously as it arises. Were such cases decided by Revenue

Officers, they would have to be guided by the evidence of Canal Officers who had examined the fields, and that course would involve an obvious waste of superintending power, as the ordinary run of cases concerns a value of not more than Rs. 3.

" Many of the remaining class of cases (*c*) need not be investigated locally ; at least questions of measurement (if from maps) could be decided anywhere ; measurements by chain, and questions of charges, which latter depend upon the nature of the crop, would generally require to be settled on the ground ; but as Colonel Greathed remarks :—" Any way (*c*) cases are now, and will be, so small in number, that a special agency for their settlement would never be thought of ; and it has been shown that in (*a*) and (*b*) cases the Canal Officers are the necessary judges."

It now remains to notice the powers and duties of the Canals Officers in their capacity of Magistrate.

The Executive and Assistant Engineers in Upper India are invested, after passing the requisite legal examinations, with magisterial powers, limited to one month's imprisonment, or Rs. 50 fine, or both, for the trial of offences under Section 70 of Act VIII. of 1873 ; such as damage to the canal and works ; interfering with the supply ; waste of water ; obstruction of channels and other minor offences. With regard to this subject, Colonel Greathed, after detailing the number of European Officers employed in a Canal Division, remarks :—" So large an European establishment could not be afforded for the sole purpose of taking up and deciding canal revenue and police cases, which though of great importance to the parties concerned, are generally of very minute dimensions; * * * which an honest man *on the spot*, soon after the occurrence, can easily decide without much judicial training, but which would be very difficult to solve by the light of evidence, at a distance."

* * * * * * *

NORTHERN INDIA SYSTEM.

The management of Canals in Northern India is now carried out under Act VIII. of 1873, which is applicable to the North-Western Provinces, the Punjab, Oudh and the Central Provinces.

Before detailing, however, the procedure under the Act, it is worthy of remark that the system about to be described is, as a matter of fact, the outcome of experience extending over a period of some 45 years, the Western Jumna Canal having been opened in 1819, the Eastern Jumna in 1830, the Ganges Canal in 1855, and the Bari Doáb Canal in 1859.

Application.—A person desirous of using canal water may present an application in a prescribed form to the nearest Canal Officer (ordinarily the Assistant Engineer or Sub-Divisional Officer). Enquiry is then made through a zilladár (a subordinate Canal Revenue Officer), and subsequently checked by the Assistant Engineeer, on the following points :—

1st,—Whether water can be given from any existing water-course. If this is considered feasible and desirable, it can be accomplished either by private arrangement between the applicant and the shareholders of the said water-course, or, if they cannot come to terms, the Canal Officer can take action under Section 20 of Act VIII. of 1873. As a general rule, it may be said that it is not considered advisable to permit the cultivators of one village to irrigate from the water-course belonging to another village.

2nd,—Whether, in the case of the answer to No. 1 being in the negative, it is desirable to give the applicant a new outlet. This depends on a variety of circumstances, *e.g.*, the existing demand for water may be already greater than the possible supply ; the land in question may be situated at too great a distance from the source of supply, anything beyond two miles is considered usually beyond the limit ; the area of the land may be too small to make it worth while to construct a new outlet ; sanitary considerations may render it unadvisable, &c.

The application and report are now forwarded on to the Executive Engineer, with the Assistant's recommendations, and is granted or not as the case may be. In the latter case, the applicant is informed of the refusal; and in the former, grants or "sanads" are issued to every shareholder, detailing the shares. They are at the same time informed that as soon as their water-course is ready an outlet will be placed in the distributary bank. The pipes or outlet having been put in place, the shareholders may take water whenever they like during their turn of rotation, for what crops they like and for what fields they like, provided always that no irrigation is permitted outside their own village unless with special permission. The shareholders in a water-course are responsible for the condition of the water-course, for any waste of water that may occur from it, and for the proper closure of the outlet during those periods of rotation when water is, by order, being passed on to cultivators lower down the distributary.

Record of Irrigation.—The tract under irrigation is watched by patrols whose duty it is to note the fields irrigated, their areas and the crops grown in their "record of irrigation" (*shudkar*), a book which they are bound always to carry about with them. This book is, or ought to be, inspected checked and initialled by every superior Officer, whether zilladár, Deputy Magistrate, Assistant or Executive Engineer, whenever passing through a patrol's beat.

Measurement of Irrigation.—Towards the end of the crop, the measurements take place, either by actual use of the chain, or, wherever they are procurable, by inspection of the village maps. Amíns measure those fields which are pointed out as irrigated by the canal patrol and by the village pátwári (who receives 2 per. cent of the collections for this and other services which will presently be detailed) in the presence of the village headman, the cultivator of the fields under measurement, and as many other villagers as choose to attend. The Amín also uses the evidence of his senses as to whether fields have been watered or not, and is thus an additional check on concealed irrigation.

A certain proportion of each Amín's work is checked on the ground by either a zilladár or Sub-Overseer, and further check measurements are made by the Deputy Magistrate, the Assistant and Executive Engineers.

Should any serious mistakes occur in any Amín's work, the whole is re-measured; but this very rarely happens, and the measurement papers are usually found to be most accurate and reliable.

Preparation of Demand Statements.—In this matter there have been some slight differences in procedure. In the Punjab the register of measurements (canal khasra) is forwarded to the Executive Engineer's Office daily, where the demand statement (khatauni) is prepared. In the North-Western Provinces the rule appears to be that the Amín before leaving a village makes up the khatauni, a copy of which is made and taken by the Patwári. The Patwári is responsible that the village copy of the khatauni is at all times accessible to any person who pays for canal water, and he has, moreover, to tender to each cultivator a slip (*parcha*) containing the particulars of water-rate due, &c. The original khatauni being forwarded by the Amín to the Executive Engineer.

Collections.—In whatever way prepared, however, the demand statements are forwarded by the Canal Officer to the Collector of the district, and the amounts due are collected and paid into the Treasury by the lambardárs or village headmen, who receive 3 per cent. of the collections for their trouble, provided always that the sum is paid in within three months of the date on which the demand statements were issued.

Any amounts not so collected are recovered by the Collector of the district in the same manner as arrears of land revenue.

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CHAPTER II.

Constitution of a Division, and General outline of the Duties and Powers of the Establishment.

The size of a Canal Revenue Division necessarily depends upon a great variety of conditions, which have to be taken into account when determining it. As a rough approximation, however, it may be said that the charge generally comprises from 80 to 100 miles of main canal and branches, 300 to 400 miles of distributaries, and 500 to 1,000 square miles of country.

Such a Division in Northern India forms the charge of an Executive Engineer aided probably by three assistants in charge of Sub-Divisions, a Deputy Magistrate, a *darogah*, three to six *zilladárs*, 10 to 20 Overseers or Sub-Overseers and the necessary proportion of patrols, *amíns*, gauge-writers, dák-runners, police guards, chaprassis and office establishment. On the Sone it is proposed to attach to each Division an Officer as Deputy Magistrate and Collector, chosen from the regular branch and transferred for employment in the Canal Department.

All Officers of a *Canal Revenue Division* should have a good colloquial knowledge of the language of the district in which they are employed, and, as it is very desirable that they should also be able to read the common vernacular sufficiently to enable them to master the contents of a ryot's petition without being compelled to have recourse to their moonshis; they should take every opportunity of acquiring that knowledge.

It is essential that they should be active in their habits; and above all things it is necessary that they should be fitted, both by temper and feelings, to deal with natives.

No Officer without this tact and temper is worth having in an Irrigation Division; and I would most strongly and earnestly advise all those who feel that dealing constantly and intimately with natives is not their vocation, to apply with the least possible delay for a transfer to a "Works" Division, or to some other branch of the Public Works Department, where the work will be more congenial to them, and where the absence of the qualities I have named will prove no hindrance to the interests of the State. To neglect these conditions is to court failure in the management of irrigation.

The following remarks on the "general duties of the establishment" have been mainly extracted from Colonel Brownlow's valuable "Memorandum on Canal Management."

General Duties of the Establishment.

The *Executive Engineer* should not tie himself down by assuming direct charge of works or administration of any particular portion of his Division, but should reserve himself for general supervision, free to move wherever his presence may seem desirable, taking especial care that the same system is preserved in every portion of his Division.

Having once distributed subordinate charges to the best of his ability, let him avoid as much as possible frequent changes in their extent or *personnel.* These tend to unsettle the establishment and render it difficult to apply past experience or to trace and check irregularities. They deprive a good man of much of his interest in his work and of his acquired local knowledge, while a bad one is seldom benefited by change of air.

As a rule, all necessary orders should be given through the Officer in charge of the work under inspection, and not to his subordinates. When one of the latter is present and the former absent, the temptation to break this rule is often great, but except in urgent cases it is best adhered to: a contrary practice being decidedly subversive of discipline and good order.

All orders, especially to natives, should be clearly conveyed in writing. The Executive Engineer should constantly place himself in communication

with the zemíndárs and ryots unattended by the usual train of native officials. Then, and not till then, will they fearlessly state their grievances.

He should transact all business in the vernacular as publicly as possible, and be perfectly accessible to all comers at certain fixed hours of every week-day.

Anonymous petitions should never be listened to, but the repetition of open and acknowledged complaints, even though apparently disproved or grossly exaggerated, is a symptom not to be disregarded.

They show that something is annoying the people and though most natives will, on slight foundation, build up an astounding accusation, villagers will seldom go out of their way to trump up a totally groundless complaint.

A firm and vigilant executive will seldom have occasion to punish severely, as irregularities are easily checked at the outset. An executive should be most cautious in accepting the assertions of his native subordinates that such and such villagers are irreclaimable scoundrels, and should occasionally call to mind a pithy native proverb: "The darkest place is under the lamp."

It is not generally considered advisable to lay down any particular set of rules for the guidance of Executive Engineers. In the words of a Superintending Engineer of the Ganges Canal,—"They should be allowed to work their Sub-Divisional Officers in their own way, much depending on individual temperaments and localities."

Assistant Engineers.—Most of the remarks under the head "Executive Engineer" apply equally to his assistants. The duties of a Sub-Divisional Officer may be broadly divided into "Professional," "Irrigation," and "Police." These will be considered in greater detail in other chapters; at present it will be sufficient to say that Assistant Engineers should be held responsible for the maintenance in working order at a reasonable cost of the Sub-Divisions entrusted to them, for police arrangements, and for proper distribution of water. They should be enthusiasts in their work and should be always on the move. They should be personally acquainted with the headmen of water-courses and principal ryots irrigating from the portion of canal in their charge, and with the characters and capabilities of all their native subordinates. They should know the number and irrigating capacity of outlets on each distributary entrusted to them. They should take every opportunity of verifying the accuracy of any measurements of irrigated lands that may be going on in their vicinity, and should by every means in their power add to the general stock of hydraulic and agricultural knowledge by observing discharges, noting the duty of water, ascertaining the outturn of crops, &c., &c. A young hand is apt to suppose that when once his distributaries are in good order he need not often inspect them, than which there can be no greater mistake; they may be in admirable order, but constant inspection will do more to keep them so than many working parties. "The master's eye is worth a dozen hands." Colonel Greathed writes:—"It is an universal rule of experience that a high standard of irrigation from a given amount of water is never attained without direct superintendence of an European Officer. It is only by unremitting energy in riding about the country, and seeing with his own eyes that the periods for taking water allotted to different water-courses are not overpassed, that the Officer in charge of irrigation can ensure the fertilization of distant lands; and no one can do this duty so well as a young Englishman."

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I have hitherto consistently urged the necessity for constant inspection; it is however equally necessary that assistants should have specified days on which they can be found at their head-quarters. Probably one day a week will be found ample for this purpose. The plan I adopted when an assistant on the Bári Doáb Canal was to be present at my head-quarters every Monday as well as on that day of the month on which I had to close my monthly accounts. This latter date will of course depend upon the orders received from the Executive Engineer; in my particular case it was the 25th of each month.

It being thus known that I was always to be found at my head-quarters every Monday, every one wishing to see me could make his arrangements accordingly; Sub-Overseers brought their imprest accounts; zailladárs made their reports; in fact, all such business of the week as could be most conveniently transacted at head-quarters was disposed of on the Monday, thus leaving me free to inspect any part of my Sub-Division during the remainder of the week.

The head-quarters of an Assistant Engineer are determined by the Superintending Engineer, and should usually be so fixed as to be fairly central as regards the work he will have to perform, due regard being had to facility for communication with the Executive Engineer of the Division.

The following notes as to the "*powers*" of Assistant Engineers are mainly extracted from Captain Howard's "Rules for the Guidance of Sub-Divisional Officers."

It is usual to leave all *temporary* establishment, such as beldars or mistris, under the entire control of the Sub-Divisional Officers, both as regards appointments, dismissal or punishments.

The power of inflicting fines on the patrols, gauge-writers, dâk-runners and others of the *permanent* petty establishment varies with the position and experience of the Sub-Divisional Officer, and such power must always be specially delegated to him by the Executive Engineer. The maximum fine thus inflicted is usually one month's pay.

No Sub-Divisional Officer has power to inflict punishment on either Sub-Overseers, zilladárs, amíns, Sub-Divisional clerks or moonshis. All cases of misconduct on the part of such men must be reported for punishment to the Executive Engineer.

First appointments, transfers and promotions of all members of the permanent petty establishment are made by the Executive Engineer.

First appointments are made from a register of approved applicants.

When a Sub-Divisional Officer wishes to recommend a man for the post of amín, patrol, &c., he should send him to the Executive Engineer with a written recommendation. If the man be approved, his name will be entered in the register, and if the Officer recommending him has expressed a desire to to have him in his own Sub-Division, a note will be made to that effect. No one, however, can receive an appointment out of his regular turn unless there are public reasons for his doing so, and the personal attendance of every applicant for an appointment is indispensable.

Transfers of permanent petty establishment are, as a rule, made in accordance with the recommendations of Sub-Divisional Officers, who are therefore responsible for having the right men in the right place.

Promotions are made half-yearly on receipt of the recommendation rolls from Sub-Divisional Officers; these are due in the Executive Engineer's Office on the 15th October and 15th April respectively.

As very great weight is attached to the recommendations made in these rolls, a Sub-Divisional Officer has the strongest inducement to make himself thoroughly acquainted with the work and character of his subordinates.

The following points regarding defaulters' sheets should be strictly attended to:—

(1) A sheet in the annexed form should be kept up to date in every particular for every man borne on the Sub-Divisional muster-roll.

RECORD OF SERVICE AND DEFAULTERS' SHEET.

——— *Division* ——— *Canal.*

Name.	Father's name.	Date of appointment.	Age at date of appointment.	Village.	Perganna.	Zillah.

Date of offence.	Offence.	Punishment awarded.	By whom ordered.	Signature of Officer.	Promotions and transfers.	Date of promotions and transfers.	REMARKS.

(2) All promotions and transfers are to be entered by the Sub-Divisional Officer, and all offences by the Officer inflicting the punishment; but no offence is to be entered of which the punishment inflicted is a fine of less than one rupee.

(3) The defaulters' sheet of every man reported to the Executive Engineer for punishment is to accompany the report.

(4) When a man is transferred to another Sub-Division, this record is to be transferred at the same time.

(5) The defaulters' sheet of a man ceasing to belong to the Division is to be forwarded at once to the Divisional Office.

The *Deputy Magistrate and Collector* should be a selected Officer, active in his habits, and thoroughly acquainted with the language, manners and customs of the district. He should move freely about the Division, deciding the numerous petty disputes about water that are constantly arising, and where necessary, punishing infractions of Canal Regulations. He should hold a Court on a specified day at a specified place once every three weeks in *each* Sub-Division, so that no difficulty may be experienced by complainants and others in ascertaining when and where cases will be tried. This arrangement also obviates the necessity for summoning witnesses from great distances to attend a Court. If, on the Sone Canals, the Assistant Engineers make a point of being at their head-quarters on a specified day, say every Monday, it would be very convenient if the Deputy Magistrate held his tri-weekly Court also at the Sub-Divisional head-quarters and also on a Monday. Much facility would thus be afforded for the transaction of business.

The Deputy Magistrate and Collector should be in constant and intimate communication, not only with the Executive Engineer, but also with the Assistants.

Under the direction of the Executive Engineer, the Deputy Collector will make every arrangement for the assessments and will aid in checking the work of any measuring parties in his neighbourhood. The Amíns are to be subordinate to the Deputy Collector, who should maintain, as regards these men, the "Records of Service and Defaulters' Sheet," of which mention has been made under the head of "Assistant Engineers."

Under the general supervision of the Collector of the District, the Deputy Collector will make the collections of Canal Revenue in the manner detailed in the rules.

Subordinate Establishment.

The *Darogah* is the highest subordinate Native Officer in the Division, and should usually be selected from the ranks of the zilladárs. He should not be tied down to any particular charge, but should, under the orders of the Executive Engineer, be continually moving up and down the line. In Colonel Greathed's words:—"His principal business is watching irrigation in the Division; enquiring into the means of extending it, or making it more advantageous to all concerned; bringing to light obstructions which might not be palpable to European Officers; and throwing into the administration all the advantage which community of race and habits affords him in dealing with zamíndárs and cultivators."

He should carefully inspect the zilladárs' books on every opportunity, and should be active in checking measurements, detecting abuses, and ascertaining and reporting on the characters and conduct of the subordinate Revenue Establishment.

Zilladárs.—A good zilladár is a man whose importance cannot be overrated. He is the right hand of his superior in all matters connected with irrigation. He should be personally active, intelligent and well versed in accounts. He should know personally all the principal irrigators, headmen of water-courses, and Patwárís, and should be known by almost every resident in his charge or zillah (this being no bad test of his locomotion). He should always know where irrigation is going on and pretty accurately to what extent, and consequently to what points water should be forced down the distributaries under his charge. He should constantly inspect and sign the "registers of irrigation" of the patrols serving under him, and should ascertain by personal inspection that the irrigation as it occurs is entered in them from the very commencement of the "fasl" (harvest). During the measurements he should check the Amín's work according to the orders he may receive. His office books should be carefully kept up and frequently inspected and signed by the Darogha, Assistant and Executive Engineers.

The zilladár and his establishment of patrols should, as a rule, be employed only in revenue matters. It may occasionally and on emergency be expedient to use them in connection with the works, but as a general rule, the less they are diverted from their proper duties the better these are likely to be performed.

Overseers and Sub-Overseers are chiefly employed as purely executive officials on the maintenance or execution of works, but can often be made most valuable auxiliaries in superintending irrigation. They are also employed, whenever possible, in checking the measurements of irrigated area. A good man should have much influence in his beat and be looked up to by the cultivators as second only to the zilladár.

Permanent Petty Establishment.

Revenue Patrols, or as they are usually termed in Upper India "chowkidars," are a most important class. Their influence for good or evil is so great that too much pains cannot be taken in selecting them and in keeping their *morale* at the highest pitch attainable. They should be active, hardy fellows of good character, and able to read and write their own vernacular.

Major Forbes has justly called them "the mainspring of the measurements"; and, as Colonel Brownlow once wrote, "by petty and untangible annoyances they can drive cultivators into abandoning the use of canal water, or, on the contrary, can, by honest exertions, largely increase the area of irrigation under their charge."

Formerly up-country all chowkidars received uniform pay, and, there being but small prospect of promotion, no inducement to good behaviour was

held out. A proposal was accordingly sanctioned by Government which raised the pay of the most deserving men, and there is now a regularly graduated scale, so that they are now much more likely to be honest, and endeavour to give satisfaction to their superiors.

The change on the Eastern Jumna Canal, on the introduction of this new scale of pay, is reported to have been marvellous; and it was estimated that Government saved, in direct revenue alone, more than double the increased outlay.

The best remedy for malpractices is, however, constant and vigilant supervision. It is also advisable to change these men from one beat to another about once in two years, as it does not take a man long to get acquainted with his new charge, and they are apt, if left too long in one place, to make private arrangements for the distribution of water,—decidedly detrimental to canal interests.

Their average charges as a rule should not exceed 5 to 6 miles of distributary, and 10 to 13 square miles of country, over which to supervise irrigation; as otherwise, a man cannot, and will not, go out to distant points and return the same day to his 'chowki' or head-quarters, having carefully inspected the intermediate irrigation.

The patrols are directly subordinate to the zilladárs in whose zillas their beats lie.

The duty of patrols consists in continually watching the irrigated area in their beats from the very commencement of the "fasl;" entering every field irrigated in the "registers of irrigation" (*shudkars*) which they are bound to constantly carry about with them; in noting and reporting at once any breach of canal regulations on the part of cultivators, such as taking water out of their turn, wasting water, grazing cattle on the banks, &c., and in at once bringing to notice any defect or want of repair in the portion of the distributary within their beat.

As a broad rule it may be said that he is the best patrol in whose beat is the greatest amount of irrigation with the least number of complaints from the ryots.

Each patrol should be furnished with a numbered badge, or *chuprass*, and belt.

Amins constitute the permanent measuring establishment. They should be picked men of even a higher class than the patrols. Indeed they should be men who might aspire to become zilladárs and darogahs. It is necessary therefore that they should not only be of good character, but also sharp and intelligent, able to read and write, and acquainted with accounts and the method of measuring land.

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Gauge-writers, as the name implies, are men detailed for the duty of registering the gauges in the canals and distributaries. No rules can be laid down as to the amount of work each man can do efficiently, but it should be observed that great care is necessary in seeing that the duties imposed upon them are not more than they are likely to perform. If the distance which they are supposed to travel, in order to register various gauges, is too great, Officers may rest assured that the men will not travel it, and that the registers will be purely fictitious. Care and common sense in detailing their duties, and constant and vigilant supervision on the part of superior officers in checking the gauges, will be the best guarantee for the work being trustworthy.

The gauge-writers are subordinate to the Sub-Overseers in whose sections their gauges are, but the darogah, zilladár as well as the Deputy Magistrate and Assistant and Executive Engineers should invariably check the gauge-readings on every opportunity. It may frequently be possible to entrust the registering of isolated gauges, such as those on distributaries, to other men, such as the patrols, giving these men a trifle extra pay for the extra work; this should, however, never be done when it is at all likely to interfere with the due performance of their legitimate duties.

Dák-runners or hurkaras are required to convey orders, reports, gauge-registers, &c., up and down the line of the canal; and thus keep the superior officers acquainted with what is going on. These men are usually expected to travel about 12 miles a day.

Office Establishment.

Sub-Divisional Clerks should be intelligent men of good character and possessing a knowledge both of English and Vernacular, and of Sub-Divisional accounts.

Sub-Divisional Moonshis should be sharp, intelligent men, thoroughly acquainted with the dialect of the district. These men are the medium through which all the vernacular work is conducted, and require to be closely looked after. The sharpest of this class are frequently great rogues, but with an energetic officer they ought not to be able to do much harm; and slow, stupid men are great hinderances to business.

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Temporary Petty Establishment.

Beldars, or as they are sometimes called up-country, "mates," are usually employed on canals in the care of the banks. They should be strong, active, hardy men, not afraid to handle a "phowrah" or "rammer," willing to turn their hands to any small repairs, able to superintend gangs of workmen, and not given to dressing themselves up in white clothes.

They are immediately subordinate to the Sub-Overseers of the section in which their beats lie, and have charge of the maintenance of the works. It is a good plan to allow Sub-Overseers to bring forward men whom they would wish to have appointed as "beldars" in their sections.

The beats are usually 6 to 7 miles of canal or distributary, and the men are expected, unless otherwise specially employed, to go over the whole of their beats daily, going up one bank and down the other. They are expected to themselves repair any trifling damage, and to bring to the notice of the Sub-Overseer any damage which may be beyond their power to repair. In the case of urgent repairs, such as a breach in a bank, they should at once take measures to get the work done, sending off at the same time a man to report the circumstance to the Sub-Overseer.

They should keep cattle off the banks, and should carry out the orders they receive as to the closure of irrigation outlets. It is a good plan to give these men badges to be worn as *armlets* round the left arm. On no account should they be allowed belts and badges like those worn by the patrols and chaprassis.

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CHAPTER IV.

The Irrigation or Administrative duties of a Sub-divisional Officer.

These duties may be classed broadly under five heads :—

1st.—The original apportionment of the water, including the enquiries preliminary to granting a new outlet.

2nd.—The actual distribution of the water, including the imposition and proper maintenance of "tatils" or periods of rotation.

3rd.—The inspection and proper registration of the irrigated area.

4th.—The supervision of the measurement of this area.

5th.—The collection of data regarding the duty of water, and agricultural operations, such as the outturn of crops, the influence of different degrees of irrigation on such outturn, the cost of cultivation, &c.

Before proceeding to consider the detail of these duties it will be convenient to investigate the reasons which have led to the adoption of the particular system of distribution which now obtains in Northern India, and which is to be

introduced on the Sone Canals; the system by which the main canals and distributaries are constructed by Government, leaving the formation of the water-courses to the cultivators, who again only pay water-rates according to the area actually irrigated.

The first point, then, which calls for special remark, is the now accepted maxim that private water-courses shall take out only from "rajbahas" or "distributaries," and not direct from the main canal.

This maxim is the result of lengthened experience on the Eastern Jumna Canal, which was opened for irrigation in 1830.

When the supply was first admitted into that canal, cultivators were permitted to irrigate from the escape channels, in which dams were erected to raise the water to the required level. Of this system Colonel Morton wrote thus:—"Very shortly after arrangements had been thus matured for extending irrigation by means of the Pandhoi and Kirsunni Nullahs, the evils inherent in the project showed themselves. The constant supply necessary for irrigation rapidly filled up the channels with deposits of silt, with which the canal water was loaded; the efficiency of the nullahs as lines of escape was completely destroyed; while the clearance of the reservoirs above the dams led to heavy and incessant expense, in order that the newly-developed irrigation might be in any degree maintained. It, therefore, became apparent that the plan thus early adopted was radically vicious and unworthy of extension."

This subject is of such importance that I need make no apology for quoting Colonel Baird Smith's opinions regarding it:—"The police of the rivers, as connected with escape water from the canal, is a most important question. At some time or other it is probable that water will be pouring into the escapes. The first act of the zamíndárs (ryots) on the banks of such rivers will be to throw earthen bunds across the channels with a view of turning the water to account for the irrigation of their fields. The effect of such work, made without system and worked without supervision, would be gradually to raise the beds of the rivers till they ceased to be competent to act as escapes at all, and became not defined channels but a series of noisome swamps, most injurious to the country near them, and absolutely destructive of our means of regulating the canal supply."

Indeed, so strong was his feeling on this point, that he recommended "that the Executive Engineer should summarily destroy all bunds erected within these channels, and should prevent any act likely to impair the efficiency of the drainage."

Colonel Morton recurs to the same subject in the following extract from his "Memorandum on Rajbahas" (written in 1853), in which he discusses the question as to the best system of distribution:—

"The evils attendant on the attempts originally made on the Eastern Jumna Canal to bring natural drainage lines into use as main channels for irrigation have been already pointed out; and it has been shown that these evils were so serious that any further extension of the system partially introduced was deemed out of the question, and that such drainage lines, as have been at any time occupied, are being gradually abandoned. With the ample knowledge on this subject possessed at the present day, whether acquired by personal observation, or by study of the recorded experience of others, no one can possibly contemplate the re-employment of such a method of irrigation.

"Indeed, on the Eastern Jumna Canal, no standing rule is better known or more strictly enforced than that which forbids any interference, on the part either of the canal establishment or of the zamíndárs, with the beds of *nullahs* which are used as escape lines in connection with the main canal or its rajbahas.

"In considering, therefore, the best means for extending the benefits of irrigation from newly-constructed canals, the choice seems to be confined to two modes, *viz.*:—

1st.—By private water-courses, issuing directly from the main canal.

2nd—By rajbahas, *i.e.*, small branch canals or principal water-courses which shall be public property, and in which alone the private heads of irrigation shall be fixed. * * *

"The evils attributable to private water-courses issuing directly from the main canal may be classed under four heads:—

"*First.*—That when their length is great they unavoidably lead to waste of water. With a view to keeping the water at the highest possible level, it is perhaps taken off from the canal at nearly the surface of a full supply; the beds of the water-courses have very seldom any perceptible slope, for the cultivators are ignorant as to how much can be given, and to avoid one extreme fall into another. The channel therefore becomes in many cases a still-water reservoir, of which the banks are rarely made of adequate height or thickness to prevent leakage; and thus, as well as by constantly recurring breaches, much loss of water is occasioned. The diminution, too, due to the absorption of the soil and to evaporation is very great, where small threads of water run in long open channels, frequently of most unnecessary width, and requiring to be repeatedly closed and re-opened in conformity with local regulations for distribution of the canal supply.

"*Secondly.*—They give rise to perpetual quarrels among the cultivators. These disputes are of two kinds; 1st, when the water-courses are of great length and pass through the land of one or more villages, to which they offer no compensation for the ground occupied; and 2nd, when several individuals unite to take a water-course between them, sharing among themselves the cost of its construction."

These remarks apply also to private water-courses taking out of "rajbahas" or "distributaries," but in a much less degree, because the lines are shorter and the shares are fewer.

With regard to the 3rd head, Colonel Morton points out that no dependence can be placed on the owners of the water-courses to keep the heads in an efficient state, and that no amount of vigilance on the part of the canal establishment would suffice to guard against accident in every spot, and that an accident happening to a head taking out directly from a main canal almost necessarily leads, from the larger quantity of water dealt with, to more disastrous results than would be the case when the outlet was in the bank of a mere distributary.

With regard to the 4th head, Colonel Morton writes:—

"Difficulty of control is another most important defect attributable to the use of private heads on the main canal." He then continues:—"Enough has now, I trust, been said to exhibit the defects connected with the method of irrigating directly from a main canal; and it only remains to point out briefly the effectual remedies for these defects, which the rajbaha system offers. *Rajbahas economise water.* Their construction and subsequent maintenance are superintended as carefully as those of the canal itself; no leakage is permitted; the larger bodies of water which they carry diminish greatly the ratio of loss by evaporation and percolation."

And he goes on to point out that they effect a peaceful settlement of many disputes; that, their heads being permanent works, they remove all danger to the canal; and, lastly, that their construction enables a better control to be maintained over the distribution of the water, so that "in the experience gained by observing, on the one hand, the disastrous effects of employing escape nullahs as lines of irrigation, and on the other, the inconveniences and loss attendant on permitting cultivators to fix their private heads of supply in the banks of the main canal, did the present rajbaha system take its rise."

The rajbahas or distributaries constructed on the Eastern Jumna Canal in accordance with these principles were not, however, at that time made at the cost of Government. Sir Proby Cautley writes:—"The plan that naturally suggested itself was to persuade the zamíndárs of villages to subscribe for water-courses dug from the canal, the excavation of which should be entrusted to the Canal Superintendent; that no advances should be made to individuals from the Canal Treasury, but that, on application, water-courses should be dug by the Superintendent, and the expense charged to the applicants."

The cultivators had thus to defray the original cost of the distributary, and the cost of its maintenance, besides paying the water-rate.

Some years later, it was determined to consolidate all these payments, and to construct the distributaries altogether at the cost of Government, and this system is not only admitted by every one to be correct, but is the one in force on all new works; on the Western Jumna Canal private water-courses still preponderate, but they are gradually being replaced by regular distributaries.

In Northern India, as a general rule, the work executed by Government ends with the construction of the distributaries and the outlets placed in their banks; sometimes, however, in those cases where it would be otherwise necessary to take several village water-courses side by side for a long distance, minor distributaries have been constructed, from which again the village water-courses take out. By this means the country is less cut up by water-courses and a more economical distribution of water can be effected.

In Bengal an attempt was made to conduct the water at the cost of Government as far as the boundary of each village; but the amount and cost of the scattered work thus entailed, the cost of the land, and, above all, the irritation caused to the villagers whose lands were cut up, speedily put an end to this system, which was discontinued by Sir George Campbell's orders.

It should here be observed that the accurate lining out and attention to levels, which are not only proper, but absolutely necessary when dealing with channels carrying large bodies of water, such as canals and distributaries, are more or less out of place when the case of private water-courses comes to be considered. The question then for the Canal Engineer is not, which is the very best possible line? but, which line, under all the circumstances, is the best? All unnecessary interference with the lands of cultivators should be avoided, and on no account should their fields be cut up when any fairly reasonable alternative presents itself.

Turning now from the construction of water-courses to the sale of water, it is evident that Government may impose either a compulsory or voluntary rate. The principal of compulsory rating, although frequently mooted and ably supported by arguments, has never yet been enforced in the Bengal Presidency, and at present, at any rate, all sales of water continue here to be purely voluntary transactions, taking the form of special water-rates.

Colonel Baird Smith writes :—" The essential principal of a special water-rate is identically the same as that which governs bargains between man and man. The State brings into the market at its own cost a certain volume of water which the community is willing to buy, and the water-rate imposed by the State is in point of fact the price it demands for its property. Where it possible to dispose of this property by free and open sale, its price would of course follow the ordinary law of supply and demand. Circumstances, however, make such a course impracticable, but I cannot help thinking that the question of water-rates will be disembarrassed of some doubts and difficulties by the distinct recognition of the principle that they must be regulated by the maximum mutual benefit of the seller and buyer."

Under the voluntary system, the transactions in water may take the form of sale by volume, by horary supply, by contract, or by detailed measurement of the area irrigated. On these points, Colonel Dyas, R.E., then Secretary to the North-Western Provinces in the Irrigation Department, wrote thus in 1867 :—

" The advantage of charging by volume, or, as the next best system, by contract, has always been clearly recognized by this Government. The great difficulty of resorting to the first method has been that of discovering a trustworthy *module*, and to this object the greatest attention has been devoted for the last four years;* until this is effected, however, the only substitutes are horary supply, or

* Colonel Baird Smith wrote in 1854 :—" It is, comparatively speaking, an easy matter to fix the theoretical conditions of constant discharge. The real difficulty arises when we have to devise the mechanical means of maintaining those conditions invariable in practice. The unmanageable element is the head of pressure from the water above the regulated outlet; for this ought in theory to be constant, whereas from the fluctuations in the depth of the canal supply, it is, in fact, continually varying, and no mechanical contrivance I have yet seen, in a very wide field of observation, has overcome the difficulty with perfect success."

All modules hitherto invented, and there have been many, have failed either because they entailed loss of head, were too expensive, were liable to be choked with silt, or were too asily interfered with by the cultivators.

contracts. The first is largely resorted to even in India wherever ancient systems of irrigation obtain, but it is a result of time and of long experience; and the same may be said of contracts.

" A multitude of petty matters of detail which can only be settled by the concurrent action of the people themselves have to be arranged equitably for the interests of all parties concerned; and in considering such question in connection with the North-Western Provinces, it must never be forgotten that canal irrigation in these Provinces is but a thing of yesterday, and that the people are only just beginning to understand, and that very imperfectly, the use of water; and that they have hardly any idea of economizing it. In 1864-65, when travelling through the districts of the North-Western Provinces, His Honor took every opportunity of explaining and impressing upon the zamindars the advantages of the contract system, which they generally admitted, but urged as a difficulty the satisfactory distribution of the water among co-sharers and cultivators: and these are the difficulties which, as already observed, time and experience alone can remove."

Indeed, as has been previously remarked, the contract system has usually failed on most canals because of the oppression of the poor by the rich, the weak by the strong, in the matter of the internal distribution of the water. It may be noted too as another objection to the contract system that it very greatly tends to interfere with the collection of statistics.

" Rates on volume and area are," writes Colonel Baird Smith, "so far as their amount is concerned, readily convertable, and there is in this respect no appreciable superiority in the one over the other." He, however, gave the preference to an indifferent system of rates on volume to any system of rates on area which he had seen in actual work, for the following reasons :—The choice of crop to be grown is less interfered with; the servants of Government interfere less with the ryots; the work is cheaper to supervise; the record work is lighter, there is a stronger incentive to Officers to improve the means of measuring water; and lastly, there is a stronger incentive to the ryot to economize water, for if, instead of drowning his fields, he makes the same volume go twice as far, he irrigates at half the cost.

Colonel Baird Smith was also of opinion that a system of sale of water by volume admitted of great sub-division, indeed, as low even as the 1-20th of a cubic foot per second; but he admitted that " the difficulty arises when water becomes so scarce and so precious that rigid accuracy is demanded alike by seller and buyer," and the fact remains that, however admirable such minute sub-division of the water may be in theory, it simply cannot be carried out in practice. If the distribution could be spread regularly over the whole year, and if each cultivator at all times required the same fixed quantity, it might perhaps be possible to sub-divide the water; but the actual conditions of irrigation are very different. As a general rule, the cultivators all want water about the same time, and experience has proved that the most economical way of distributing it, especially at seasons of great demand when the rush is great, is by keeping it together in strong streams. The one-twentieth part of a cubic foot per second would do but little good to the unfortunate cultivator, either at sowing time or during a prolonged break in the rains.

The conclusion therefore seems to be that, under a voluntary system, no more satisfactory method for the sale of water can be adopted, at any rate on a new canal, than that of the detailed measurement of the irrigated area.

* * * * * * *

Turning now to the apportionment of the water, it may be remembered that in a former chapter it was stated that in Northern India a preliminary enquiry has to be made before an application for a new outlet is submitted for sanction to the Executive Engineer of the Division.

The following is the information required :—

1. Name of village, pergunna, and district.
2. Name of applicant.
3. Name of supply channel.
4. Proposed site of new outlet, *i.e.*, on which bank of distributary and

at what distance from the head.

5. Approximate area of land to be irrigated.
6. Number of pipes required, *i.e.*, the amount of water.
7. Whether irrigation will be by flow or lift.
8. Approximate length of the proposed water-course.
9. Name of owners of lands to be traversed by the water-course, whether they are willing to give right-of-way.

N. B.—If willing, agreement duly signed by the parties concerned to be appended to the application.

10. Whether the lands are irrigable from any existing outlet or not.
11. Number and names of shareholders (if any) in the outlet applied for.
12. Number of outlets now in supply channels ... ... } Right bank. } Left ditto.
13. Width of bank, including slope and pathway.
14. Number of outlets already allotted to the village.
15. Culturable area ... ... } Whole village. } Applicants' lands.
16. Area already provided with irrigation... ... ... } In village. } In applicants' holdings.

The applicant, with the help of the zilladár, furnishes the information required for Nos. 1 to 11 inclusive. These are checked by the Sub-Divisional Officers by means of maps, levels, and personal inspection, and the remaining information is supplied from the records of the Canal Office.

None of the points require any detailed notice here, except No. 6, *viz.*, "the number of pipes," or in other words, "the amount of water," required. This is a most difficult question, and opens up the whole subject of the "duty of water." Indeed it may be said that with our present knowledge a rough approximation at best is all that can be obtained.

In 1867 a series of experiments were made by Mr E. C. Palmer and his brother Captain Palmer to ascertain the best size of pipes for the Bari Doáb Canal.

They first ascertained very carefully the actual discharges through various sizes of pipes. The results being as follows:—

Diameter of Pipes.	Head of Pressure.	Actual observed Discharges.
0·285 feet ...	0·2 feet	0·0570 cubic feet per second.
" " ...	0·4 "	0 0732 " "
" " ...	0·6 "	0·1083 " "
0·4 " ...	0·2 "	0·2318 " "
" " ...	0·4 "	0·3323 " "
" " ...	0·6 "	0·4137 " "
0·48 " ...	0·2 "	0·3130 " "
" " ...	0·4 "	0·5003 " "
" " ...	0·6 "	0·5981 " "

The pipes in each case being of well burnt clay, unglazed, and 15 inches long, both ends submerged.

They also found that two pipes laid side by side gave about $2\frac{1}{2}$ times the discharge of a single pipe of the same diameter under the same head of pressure. This increased discharge being ascribed to the higher velocity of approach caused by the larger aggregate opening.

The actual discharges having thus been found, other experiments were made with the object of ascertaining the actual depth of water required on fallow ground previous to ploughing.

The results obtained were as follow:—

Very light sandy soil required 13,509 cubic feet per acre, or say a depth of 3·72 inches.

Ordinary loamy soil	"	8,739	cubic feet per acre	2·40 inches.
Heavy clay soil	"	9,960	" " " "	2·79 "
Average good land	"	9,257	" " " "	2·52 "

They also found that the mean area of 50 *jhullar* (Persian-wheel) farms, actually measured, was 52 acres, of which 22 acres were cultivated during the kharíf and 30 acres during the rabi season; that when watering from wells an average depth of 3·36 inches of water was given to the fields; and that the season for ploughing lasted about $1\frac{1}{2}$ months. It appeared, therefore, acording to these figures, that a farm of this size could be properly prepared for ploughing with the aid of the water discharged from a pipe 0·4 feet in diameter with a head of pressure of 0·4 feet (which was assumed to be the average head in the distributaries of the Bári Doáb Canal) on the supposition that the outlet was to remain open only one day in four; and, as (with the exception of rice) no standing crop requires for each watering more than half the quantity of water per acre that is necessary to saturate the ground for ploughing, it followed that this sized pipe was sufficient to mature all crops, except rice, on such a farm.

In accordance with these experiments the size of pipe for the Bári Doáb Canal was fixed at 0·4 feet internal diameter; and the usual rule observed in granting outlets was to allow one pipe for a holding of 20 acres, two pipes for one between 20 and 50 acres, and three pipes for a still larger holding.

It should be noted here that Colonel Brownlow objects most strongly to this system of doubling and trebling pipes, and considers that it is infinitely perferable to use pipes of varying sizes.

Some experiments I made in 1871-72 on the Shalimar Rajbaha seem to show that the allowance above-mentioned is ample for the Bári Doáb Canal. Out of 211 outlets, of which 35 were single pipes, 51 double pipes and 125 treble pipes, I found that during the kharíf crop, the single pipes each watered about 5 acres, the double ones about 15 acres and the treble ones about 30 acres; during the rabi the single pipes watered 14 acres, the double ones 38 acres, and the treble ones 77 acres. During that particular year, therefore, and on that particular distributary, a single pipe outlet was sufficient for 19 acres, a double one for 53 acres, and a treble one for 107 acres. The year, moreover, was not a favourable one as I only obtained a duty of 33·8 acres in the kharíf, and 92·2 acres in the rabi, or 126 acres in the whole year per cubic foot per second discharge.

In the previous year, a very dry one, I had obtained on the same distributary a duty of 175·3 acres per cubic foot per second.

To turn now to the general question of the duty of water, it is evident that this depends upon such a variety of circumstances that it is improbable that any two canals, or indeed parts of the same canal, will ever show the same "duty." It depends upon the amount of water required for each watering and the intervals between the waterings.

The first of these conditions depends to a certain extent on the nature of the soil, and also on the kind of crop grown. The second depends upon the distribution of the rainfall, the porosity of the soil, and again also on the kind of crop grown.

Mr. Palmer's experiments quoted above show the great variations in the amount of water required to prepare various soils for ploughing, but even if we take as an average depth of say $3\frac{1}{2}$ inches of water as sufficient for the purpose of ploughing, it is evident that some standing crops will require a greater depth of water over the land at each watering than others.

Thus, rice is said to require fully twice as much, and sugar-cane once and a half times as much, water at each watering as wheat does.

Again, as regards the intervals between the waterings, it is evident that when there is a heavy and well distributed rainfall, less water will be required than when there is little or no rain; some crops, too, require less frequent waterings than others. In the Ganges Canal Report for 1868-69, Mr. Brind, the Executive Engineer of the Meerut Division, gave the following information regarding the average number of waterings and the intervals between them, required to mature various crops:—

Barley, 3 waterings at ... ... 20 days' interval.
Wheat, 4 ,, ... 20 ,, ,,
Cotton, 3 ,, ... 20 ,, ,,
Gram, 1 ,, ...
India corn, 4 ,, ... 15 ,, ,,
Indigo, 5 ,, ... 9 ,, ,,
Rice, 5 ,, ... 10 ,, ,,
Sugar-cane, 10 ,, ... 22 ,, ,,

On the Bári Doáb Canal—

Sugar-cane is stated to require ... ... 10 waterings.
Rice ,, ,, ... 12 ,,
Wheat ,, ,, ... 4 ,,
Cotton ,, ,, ... 3 ,,
Gram ,, ,, ... 1 or 2 ,,

From information received regarding Shahabad it would appear that there—

Wheat requires 3 to 4 waterings at intervals of ... 20 to 30 days.
Barley ,, 2 ,, 3 ,, ,, ... 30 ,, 40 ,,
Peas ,, 2 ,, 3 ,, ,, ... 30 ,, ,,
Sugar-cane ,, 8 ,, 10 ,, ,, ... 15 ,, 20 ,,
Poppy ,, 8 ,, 9 ,, ,, ... 12 ,, ,,
Mustard ,, 3 ,, 4 ,, ,, ... 30 ,, ,,
Indigo ,, 6 ,, ,, ... 12 ,,
Tobacco ,, 8 ,, ,, ... 12 ,,
Cheena ,, 8 ,, 10 ,, ,, ... 6 or 7 ,,

The duty of water in the main canal and branches should worked out in two different ways: 1*st*, on the whole amount entering at the head of the canal; 2*nd*, on the amount actually expended, *i.e.*, deducting the quantity passed off in escapes.

Of these methods Colonel Brownlow writes :—"Both methods are necessary in order to illustrate fairly the working of a canal. The degree in which a work answers or falls short of its original design, and the extent of its potential capacity, are best brought out by the former method; while the latter method (take the engineering conditions as they stand) brings out the administrative results in its management year by year. Viewing the following figures in this light, it appears that the potential capacity of the Eastern Jumna Canal is more in accordance with the necessities of the district through which it passes than that of the Ganges Canal; and *secondly* that the administration of the former is more successful than that of the latter, In considering these result, however, the vast difference in scope, magnitude, and period of operation between the two canals, puts any accurate comparison out of the question."

The figures referred to in the above quotation are as follow, and show the duty during the year 1871-72:—

Canal.	Duty per cubic foot on volume entering Canal.	Duty per cubic foot on volume expended.
	Acres.	Acres.
Ganges	144·7	188·1
Eastern Jumna	196·3	205·5

The following table gives similar figures for the year 1872-73 :—

Canal.	Duty per cubic foot on volume entering Canal.			Duty per cubic foot on volume expended.		
	Kharíf.	Rabi.	Whole year.	Kharíf.	Rabi.	Whole year.
Western Jumna	89	71	160	105	85	190
Eastern ,, ...	75	100	175	...	...	184
Ganges	48	96	144	...	...	162
Bari Doáb	47	79	126	79	110	189

It is to be noted, when comparing the duty of water on different canals, that the percentage of crops grown affects the question in a very great degree; some crops requiring so much more water than others.

Turning now to the question of the duty of water in distributaries, it is evident that it also can be calculated in two different ways, *viz.* :—

1*st*.—On the average volume expended during a crop, and this is the usual way.

2*nd*.—On the volume expended, rejecting all seasons of "no demand."

An example will make this clearer.

Let us take the case of a distributary calculated to carry, say, 100 cubic feet per second. It will not always be carrying its full volume; on many days the supply will probably be much lower, or even if full, very little may have been used. Now suppose that on taking out the *average* of water expended in that distributary during the crop, we find it to be 82 cubic feet per second. Suppose also that we find that 9,500 acres have been irrigated during that crop from that distributary, we should have by the first method mentioned above $\frac{9500}{82}$ = 116 nearly, *i.e.*, the duty of the water would have been about 116 acres per cubic per second.

This, however, would not really represent the truth, because it would lead one to suppose that had we *daily* turned down 82 cubic feet we should have obtained 9,500 acres of irrigation; and this is not the case, for during the season there may have been several rushes or demands for water when 82 cubic feet per second would *not* have been sufficient for the purpose. As Major Moncrieff says :—"What is really required seems to be an idea of the volume of water we use at the time we want it. It matters little that we can obtain abundance at every other time if the supply fail us then."

Let us then ascertain the average discharge during those seasons when water was greatly in demand; and suppose we find that during those periods the average expenditure of the distributary was 97 cubic feet per second we should then have $\frac{9500}{97}$ = 98 nearly, *i.e.*, the duty of the water would have been only about 98 acres per cubic foot per second; so that had we only maintained a steady supply of 82 cubic feet, the result would probably have been that we should have only irrigated about 8,000 acres instead of 9,500.

When speaking of my observations on the Shalimar Rajbaha, I mentioned that I had obtained a duty of 33·8 acres in the kharíf, and 92·2 acres in the rabi, or for the whole year 126 acres per cubic foot.

These figures were arrived at by dividing the assessed irrigated acreage by the discharge with a full supply, *viz.*, 130 cubic feet per second, because I had not at the time the means of ascertaining more exactly the actual volumes sent down at seasons of demand, and I knew that I invariably endeavoured, generally with success, to send down a full supply whenever it was actually needed by the cultivators.

Captain Ross, R.E., obtained the following "duties" for seven distributaries of the Bolundshahar Division in 1872-73. The quantity of water sent down being measured only at seasons of demand :—

In the kharíf 75, 45, 78, 77, 59, 46, and 45 acres per cubic foot per second.

In the rabi 138, 119, 139, 121, 110, 86, and 86 acres per cubic foot per second.

Referring to these figures, Major Moncrieff writes :—"It is not encouraging to find that on the Kulda Rajbaha, which runs through dry light soil, and which Captain Ross says is 'characterized by a constant drought, even in rainy winters, and a corresponding steadiness of irrgation returns,' in spite of all this, and of its being now an old established line, and at present under a most experienced subordinate, still the duty per cubic foot of water per second measured only at seasons of demand, is not above 78 acres kharíf, and 139 rabi.

"Knowing equally well the conditions of country on the Ganges and Eastern Jumna Canals, I think it not improbable that the high duty on the latter arises rather from the excessive saturation of the soil than from perfection of arrangements. If so, we must cease ever to expect a like return on the Ganges Canal, unless we are prepared for the attendant evils of very close irrigation."

Another point also to be prominently borne in mind when comparing the duty of water on different canals is the amount and distribution of the rainfall, and in doing this it must not be forgotten that the intervals between falls of rain are more important than the total rainfall.

To give an instance:—The average rainfall of 18 years (1856 to 1873) at Cuttack is 54·50 inches, there have been seven years above the average, *i.e.*, ranging from 63 to 82 inches; two years about the average or 53 to 55 inches; and nine years below the average, or between 23 and 50 inches.

Now in 1865, when the rainfall was 47·45 inches, the rains were very favorable up to September, and the prospects of the crops were good: from that date, however, not a drop fell, and the results was the disastrous Orissa Famine.

In 1873, on the other hand, only 35·84 inches of rain fell, *i.e.*, 11·61 inches less rain than in 1865; but it was well distributed, and the crops are reported to have been upon the whole fair.

It will thus be seen that no estimate of the outturn (of rice crops in particular) can be drawn from a comparison of the *annual* rainfall; a break in the rains for a fortnight probably may, and for a month certainly will, ruin the crops notwithstanding that there may have been a larger *annual* rainfall than ordinary.

Now as regards the amount of water at the disposal of Officers; the Ganges Canal was designed to carry 8 cubic feet per second per lineal mile of main canal, *i.e.*, 1 cubic foot per gross mile of area, supposing the canal to irrigate 4 miles on either side, or 0·8 cubic feet per square mile, if the irrigation extended to 5 miles, or about ·7 if it extended to 6 miles on either side. The amount of water thus assumed to be required was deduced from experience of actual irrigation on the Eastern Jumna Canal. The same system was followed in designing the Bári Doáb and Sirhind Canals, except that the proportion of water per lineal mile was eventually reduced to 6 cubic feet per second.

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To come now to the question on which the Sub-Divisional Officer has to express an opinion, *viz.*, the number or size of pipes which a cultivator will require.

I must again repeat that it is perfectly impossible to lay down beforehand absolute rules on this subject; all that can be attempted is a confessedly rough approximation.

It will be necessary first to ascertain the size of the holding or holdings to be irrigated, and also the proportion which the proprietor proposes to sow with rice or other kharíf crops, and the proportion which will be under wheat or other rabi crops.

For rice it will probably be desirable to grant water at the rate of 1 cubic foot per second for every 30 to 40 acres, the outlet to remain open at the pleasure of the cultivator, that is to say, no *bandi* or *tatil* being imposed. It has been found on the Midnapore Canal that 1 cubic foot per second will, for the first watering, scarcely irrigate more on an average than 3 acres of rice a day—a result which might have been expected, as a cubic foot flowing during 24 hours would cover 3 acres to about the depth of 8 inches, of which probably 3 would be almost immediately absorbed, leaving 4 or 5 inches standing on the field, *i.e.*, about the usual amount required in rice cultivation.

The duty of the water will of course depend on the intervals that can be allowed between the waterings; in Midnapore, where there is usually a heavy rainfall, water is frequently not required again for 30 or 40 days; in

Behar, however the rainfall being so much less, 10, 12 or 14 days will probably be the longest possible interval.

Now, if this be correct, the duty will vary from 30 to 40 acres per cubic foot, and at any rate, Officers will be on the safe side if they commence by giving out water on this scale. Experience will soon enable them to judge what modifications are necessary.

For the cold weather crops the same sized outlet (*viz.*, one giving a discharge of 1 cubic foot per second) would, if kept open only two or three days in the week, water 40 to 50 acres of spring crops.

* * * * * * *

The great difficulty in deciding beforehand on the size of pipe required by a cultivator is the impossibility of determining at a distance, and without a full knowledge of the necessary facts, the discharge which a pipe will give; it depends on the head of pressure, the slope of the water-course, &c.

Very careful experiments and observations must be made by every Officer employed on the canals before it will be possible to arrive at anything like a right decision on this point.

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With regard to the question of flow and lift irrigation, it may be remarked that distributaries are usually aligned on a ridge running between two minor drainages and are so constructed as to water all or a large proportion of the commanded area by flow irrigation. There will, however, often be isolated patches which cannot thus be reached by the water; in such cases the water must be raised by the cultivators by mechanical means—the *jhullar* or *Persian wheel*, the *mot*, the *lat*, the *dhoon*, or the *sair*. Stop dams or other devices for raising the water in a distributary should not be allowed on any pretence whatever. If the land cannot be watered by flow from the distributary and the people will not use mechanical means for lifting it to the required level, it must go unwatered; this principle requires to be distinctly understood and acted up to by all Irrigation Officers.

The average portion of flow to lift on the Ganges Canal may be taken at about 75 : 25, and on the Bári Doáb Canal at about 90 : 10.

There is another point connected with canal irrigation that demands a word, *viz.*, the habit of "double cropping" the land. Colonel Brownlow in the Revenue Report of the Bári Doáb Canal for 1873-74 after, stating that there had been an increase of nearly 10,000 acres of "do-fasli" land upon the area of 1872-73, which was again more than 3,000 acres in excess of that of the previous year, continues—"This is, in my opinion, no subject for congratulation. The facility afforded by it for over-cropping the land is one of the least desirable characteristics of canal irrigation." All Officers should discourage this practice, which exhausts the land by over-cropping, and will render a great service to the cultivators by pointing out the evils of this system.

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It is well to remark that there is a general consensus of opinion amongst Canal Officers of any experience that by means of *tatils*, and by their means alone, can proper economy be enforced.

Mr. Palmer, after many years' experience in the largest Revenue Division of the Bári Doáb Canal, stated as his deliberate opinion that no Officer was making the most of the water entrusted to his charge who allowed any outlet to run oftener than one day in four.

Tatils should not only be most carefully imposed with due regard to all the circumstances of the case, but should be duly notified to all the cultivators, and once imposed should not be lightly altered. Spasmodic or intermittent *tatils* are, as a rule, worse than unless, and only tend to harass and unsettle the cultivators. Ordinary *tatils* should be imposed only after they have been sanctioned by the Executive Engineer, and extraordinary ones, or those absolutely necessary during a great drought, should be put in force, if

possible, under the immediate superintendence of a European Officer. It ought also to be thoroughly explained to the cultivators that no canal subordinate wields the power of altering these periods of rotation.

In Upper India, where the distributaries are often of great length, it becomes necessary to impose *tatils* within the distributaries; for example, the *Shalimar Rajbaha* of the Bári Doáb Canal is over 21 miles in length, discharges about 130 cubic feet per second, and has taking out of it 217 outlets of sorts. It was found that all of these could not be supplied at the same time, and it therefore became necessary to impose a *tatil*. To ascertain the distance to which this should extend, I caused all the outlets to be opened, and by actual inspection found that when a full supply was going down the distributary, the 139 outlets, *viz.*, those extending from the head to about the 15th mile received plenty of water. I accordingly directed that these outlets should remain open four days in the week, *viz*, Monday, Tuesday, Wednesday and Thursday, and that they should then be closed; the remaining 78 outlets in the last six miles getting their supply on Friday, Saturday and Sunday.

The great difficulty, of course, in enforcing a *tatil* of this sort at seasons of great demand, lies in the great number of outlets (*viz.*, in this particular case 139, scattered over a length of 15 miles) which must be watched. It will be readily understood that on such a distributary as the Shalimar Rajbaha, there is no help for this, and that difficulties can alone be overcome by the vigilance of the Sub-Divisional Officer.

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When *tatils* are established in distributaries, cultivators are expected to close their own outlets, and a neglect to perform this duty (after due warning) is treated as breach of *tatil*.

The water-course having been constructed and the outlet placed in the banks of the distributary, the actual distribution of the water may be left in the hands of the cultivators, the Canal Officer merely interfering on a complaint being made by any shareholder that he is being deprived of his fair share of the water.

In a previous chapter it was stated that it was the duty of the patrols to keep up a record of the irrigation as it progressed. An important part of the duty of a Sub-divisional Officer is to see that the orders on this subject are properly carried out. By occasionally checking the patrol's work on the ground, these men will be kept up to the mark.

With regard to the duties of Sub-divisional Officers during the measurements, Captain Howard's orders to his Assistants are that "they should make a practice of visiting each Amin's party at least once during each measurement without giving previous notice of their intention to do so. The points to be specially noted are whether the Patwári and patrol are present, and whether the Amín is doing his work neatly, accurately and quickly, and without assistance."

Lastly, with regard to the collection of data, it is only necessary to impress on Sub-divisional Officers the urgent need there is for obtaining well authenticated facts relative to the duty of water, the difference in outturn between irrigated and unirrigated crops, the cost of cultivation, the profit made by the cultivators, the times of sowing and reaping, the amount of seed used, the quantity of water taken, and the intervals between the waterings, and many other points regarding which at present but little reliable information is to be had. Such facts as I have been able to collect on these points will be found in a subsequent chapter, but I must repeat that it is to the energy and intelligence of Sub-divisional Officers that we must look to fill up the blanks which unfortunately so largely exist.

CHAPTER V.

THE POLICE DUTIES OF A SUB-DIVISIONAL CANAL OFFICER.

It has already been explained in a previous chapter that Canal Officers in Northern India after acquiring the necessary knowledge are invested with magisterial powers, and that upon them devolves the working of certain administrative branches, more or less connected with the canal, such as the Police or protective, the Judicial punitive, and the Judical civil.

It has also been shown that cases instituted under these heads are usually very minute in their dimensions, very simple in their character, and quite within the capabilities of any honest man on the spot to decide. The entertainment therefore of a special body of Officers for the sole purpose of hearing such cases would entail an expense quite out of proportion to any good that might be expected to result.

* * * * * * *

The most common offences, in the order of their frequency, are—grazing cattle on the canal banks, making ghats across distributaries, breaches of *tatil*, stealing water from another person's water-course, and wasting water.

The first offence, that of grazing cattle on the canal banks, has, perhaps, caused more trouble throughout the length and breadth of India wherever there are canals than any other class of misdemeanour. It is true that cattle can be driven to the nearest pound by the patrols, acting as the private policemen of the Canal, but if they are opposed, as is constantly the case, they must let them go as soon as they are off the canal bank; a report of the circumstance being made though the zilladár to the Sub-Divisional Officer. It has been found that threats, fines, as well as severer punishments merely harass and annoy the cultivators, without having the desired effect and that the only way of putting a stop to presistent grazing is to put up a good fence or hedge.

Colonel Baird Smith, many years ago, wrote :—"The crying evil of the existing canal police system appears to me to be the levying of an immense number of petty fines for trespass of cattle on the canal banks. I have no hesitation in expressing my conviction that the universal repugnance of the native community to this system is well founded; that it is abused by our native establishment, and that it ought to be avoided on the Ganges Canal, and abolished as soon as possible on the Jumna Canals. I would rather that our works sustained a little damage now and then that we should continue to maintain a system so open to objection, and in my opinion so ineffective.

"My view of the question is that we should make strenuous efforts to raise thick protective hedges along our canal boundaries, and that the attention of Executive Officers has already been called by me to this matter. * * * Once our system of enclosure is efficient, we can then enforce penalties against wilful trespass without scruple, but till it is so, I confess it seems to me to be expecting too much from *bovine* virtue, that it should be able to resist the rich pasture our banks will tempt it with almost immediately after the admission of water into the canal channel. Wilful trespass accompanied with proved injury to the works is punishable, but if no injury be done, I do not think the mere act of going on the canal bank should be regarded as trespass till we have enclosures."

Colonel Brownlow in his "memorandum" writes :—"Where grazing is persisted in and damage done, it is patent and visible; the grass and perhaps some young trees are trampled down or slopes of earthwork are injured. Summon the people who are in the habit of grazing on the adjoining land, show them the injury done, and take from them a *moochalka*, or bond, that they will prevent the like in future, or be liable to a fine not exceeding Rs. 50. The Canal authorities on their part can put up a good fence."

I have dwelt somewhat at length on this subject because I believe it to be a most important one as regards retaining the good will of the inhabitants of the tracts bordering on the canal. A single bullock or buffalo can, and does, do an immense amount of damage to a canal bank, especially when this is new and

after rain; but I have seen and known of so much annoyance caused to the ryots by permitting the patrols and "beldars" to impound cattle that I consider that they ought never to be permitted to exercise such powers. Let them drive the trespassing cattle off the banks, and if the offence is frequently repeated, and the signs of damage are great, let a report be made to the Assistant Engineer, who can then either use his influence with the villages to prevent a repetition of the offence or take steps to impound the cattle himself, or order the Zilladár or Sub-Overseer to do so.

I must repeat, however, what has already been several times pointed out, that a good thick hedge is the true solution of the great cattle trespass difficulty.

With regard to the second offence, that of making "ghats" or tracks across distributaries, I cannot do better than quote Colonel Brownlow's words :— "When ghats are made by foot passengers across rajbahas there is no use in fining (at least I have never found it stop the practice), so accept the situation and place a couple of stout straight logs alone side of each other across the channel. People infinitely prefer going dry shod to wading through the water, and will consequently abandon the ghat for the bridge. I may here mention that no earth or brushwood should be allowed on a log bridge, as they are liable to fall into and choke up the rajbaha channel; the best plan is to purchase a suitable tree in the nearest village, halve and dress the trunk placing the two pieces side by side. Where cattle are driven across a rajbaha, it is generally a sign of a village road having been left unprovided with a bridge, and the sooner one is built there the better."

Villagers not unfrequently apply to the Sub-Divisional Officer to be permitted to put up a rough timber bridge for themselves across a distributary; this should never be permitted : if the work is necessary, it should be done by the Canal Officer and not by the villagers.

When there are villages on or near the banks of a canal or distributary, the people soon make a practice of bathing in the stream and thus frequently make very objectionable ghats by breaking down the banks and slopes. The remedy consists in making brickwork bathing ghats for them at their favourite places.

It is often difficult, where there are recognized cattle ghats across a canal, to prevent the animals leaving the regular crossing, and wandering instead a little way up or down the canal before attempting to get out of the water. Such a practice, if permitted, ruins the banks in a very short time, and it is therefore quite worth while to adopt any inexpensive remedy. On the High Level Canal in Orissa this is accomplished by erecting a bamboo fence, not only on both sides of the ghat, but extending for some twenty or thirty feet up and down the canal : this arrangement greatly simplifies the task of driving cattle straight across. Such fencing is not only very efficacious, but if neatly but put can be made to look very nice.

* * * * * * *

Turning now to the fourth offence on the list, *viz.*, that of stealing water from another person's water-course, a moment's inspection will verify the truth of the accusation, as the cuts or breaches made in the banks of the complainant's water-course, and the signs of irrigation in the defendant's field, will be apparent. Colonel Brownlow recommends that in such cases the dispute should be settled by village "pancháyet;" if, however the people cannot thus come to terms, the matter must be taken into the Deputy Magistrate's Court.

Lastly, among the common offences come "waste of water." This may occur sometimes from sheer laziness on the part of the cultivator, who, when not in urgent need of the water, may let it run to waste sooner than go 100 yards to put a broken water-course bank to rights; but I believe it results more often from actual ignorance as to the fact of waste going on. As a general rule, I have not found it necessary to inflict any punishment for this offence, certainly not until I have been satisfied that it has been perpetrated repeatedly or wilfully. My own experience having been that a warning to the cultivator has usually been sufficient to prevent a repetition of the evil complained of.

In addition to the foregoing, other offences against the canal regulations are sometimes, though rarely, committed, such as throwing a dam across a distributary, interfering with the regulating apparatus, injuring the works, increasing the size of outlets, cutting down or damaging the trees, &c. It is sufficient to say that all such cases should be rigorously prosecuted before the Deputy Canal Magistrate, and no mercy should be shown to offenders causing wilful damage.

It has before been remarked that the great secret in canal, as indeed in all Indian administration, is personal government. With good Officers, sympathising and in contact with the people while at the same time resolved on seeing justice done to the Government which employs them, almost any system can be worked successfully, and in nothing is this more marked than in the execution of the canal police duties. An active Sub-Divisional Officer, with a good temper and a good knowledge of the vernacular, will rarely have to resort to severe punishment in order to enforce the discipline of the canal.

F.

Notes as to duties of Canal Revenue Establishment on certain Canals.

(*a*)—On the Western Jumna Canal.

Duties of the Revenue Establishment on Western Jumna Canal.

1. The Canal Revenue Establishment consists of the following officials :—

Patrols.	Zilladárs.
Patwárís.	Darogha.
Amíns.	Deputy Collector.

2. The general duties of a canal patrol are as follow :—

(i). To visit all the villages in his beat, and to record in his shudkar, every field receiving canal water as soon as possible after the first watering.

(ii). To patrol the banks of the rájbahas and to see that the distribution of water within his beat is regulated in accordance with orders, and that all outlets are closed during periods of authorized tatil, also to report all damage to banks or works, and in cases of emergency to take such immediate action as may be necessary.

(iii). To inspect the village water-courses in his beat, and to report when the owners fail to keep them in proper repair.

(iv). To report all cases of waste of water or unauthorized irrigation, making immediate enquiry into the facts of each case that may come to his notice.

(v). To write up regularly the readings of all the gauges in his beat which he is called upon to register.

(vi). To collect miscellaneous receipts under the orders of the Zilladár.

(vii). To accompany the Amíns during the final measurements of the irrigation in his beat.

(viii). To assist in the distribution of miscellaneous notices that may be circulated within the villages.

3. Canal Patwárís are appointed generally in the ratio of one over every two patrols. The duties are as follow :—

(i). To constantly inspect the shudkars of the patrols in his circle to see that they are regularly and correctly written up to date, and to enter therein the names of owners and areas of fields from the copy of the village khasrah in his keeping. The Patwári is jointly and equally responsible with the patrol for the correctness of the shudkar.

(ii). To accompany the Amíns during final measurements, and to compare the entries in the Shudkar with those in the Amín's khasrah.

(iii). To prepare the khatauni for each village from the Amín's khasrah as soon as the latter is completed.

(iv). To make out the parchas for each cultivator, and to assist in their subsequent distribution.

(v). To submit monthly or bi-monthly abstracts of the shudkar to the Zilladár.

(vi). To keep himself informed of all changes among the owners and occupiers of irrigated land within his circle, and to report at intervals the decrease of shareholders in water-courses and other changes.

4. The Amín is employed for the purpose of making the final measurements towards the end of a crop upon which the assessments are based and on the Bári Doáb Canal checks the khataunis in the Head-quarters' office after receipt from the Patwárís. In the intervals between the measurements he is employed in distribution of parchas, and in miscellaneous duties not connected with the measurements. His main function is to ensure a complete and independent check on the measurements recorded by the patrol and Patwárí.

5. The Zilladár exercises a general supervision over the work of the patrols, Patwárís and Amíns within his circle, and is responsible for its efficient performance. His duties are—

(i). To constantly check the shudkars, and to satisfy himself that they have been regularly written up, up to date.

(ii). To send in monthly or bi-monthly abstracts of the shudkars in his circle to the Divisional Officer for the statement of irrigation operations.

(iii). To keep the Divisional Officer constantly informed of the progress of irrigation in his circle, of the relation of the demand for water in each part to the supply, and of all changes in the regulation and distribution of water that may from time to time be necessary.

(iv). To enforce the strict observance of all authorized tatils, and to see that water is regularly delivered at the tails of rájbahas on the days appointed.

(v). When necessary to undertake the prosecution for offences under the Canal Act.

(vi). To investigate all cases of waste of water and unauthorized irrigation, and to report the same for orders.

(vii). To arrange the order of the final measurements within his circle, and to take care that they are carried out as sufficiently and expeditiously as possible.

(viii). To supervise and check the preparation of the khataunis by the Patwárís and to see that they are punctually submitted.

(ix). To collect through his Patwárís or patrols all miscellaneous revenue, within his circle, upon warrants issued by the Divisional or Sub-Divisional Officers and to account for the same in his cash book, and other prescribed forms.

(x). To enquire into and report on all cases of objections to the measurements that are referred to him by his superior officers, or received by him direct from the cultivators or that have been recorded by the Amíns.

6. The Deputy Collector exercises general supervision over all the Zilladárs in a Division, and also over the Vernacular office. He is required to check a percentage of the measurements, and to see that all the Zilladárs' records are properly kept up, and their work efficiently performed. He is as a rule, invested with 2nd class magisterial powers, for the purpose of trying offences under the Canal Act. He is also employed in all important or complicated enquiries relating either to disputed assessments, to claims for compensation, or to the mutual rights and liabilities of the owners of water-courses and other members of the irrigating community. He ranks as an Assistant Engineer and is entitled to the privilege of a chair.

7. In large Divisions a Darogha is also employed, as a sort of Naib-Deputy Collector. A portion of the Division is made over to him, in which he performs the duties of a Deputy Collector, excepting the magisterial. He is not invested with powers nor is he entitled to a chair.

8. The Lambardár is responsible to the Civil Department for the collection of the canal revenue, and receives fees, amounting to 3 per cent. on the collections. In consideration of these fees he is expected to pay full amount of demands into Treasury within three months, to accompany the canal patrols and Patwárís as often as possible when writing up the shudkar in his village, to give the correct names of the cultivators, and to sign the shudkar as evidence of his having been present. He should also invariably be present at the final measurements by the Amíns, and assist in the subsequent distribution of parchas within his village. It is his duty to prevent, as far as possible, any concealment of irrigation, and generally to assist the canal officials in all enquiries connected with the measurements, or with irrigation within his village.

9. The District Patwárís receive a percentage (varying from 4 to 1) on the owners' rate. It is believed that their title to this has been conceded, the owners' rate being regarded in the aspect of land revenue. In the districts in which owners' rates are assessed, the District Patwárís are expected to be present as often as possible at the final measurements by the Amíns, the progress of which is expedited by their assistance. They are, however, very frequently absent on duties in their own Department, and their presence at the measurements is not *absolutely* necessary. In the Hissár district where there is no owners' rate, the District Patwaris do not attend the measurement, and receive no fees. The District Patwárí is also expected to inform the Canal Patwárí from time to time of all changes in the ownership of lands irrigated from the canal, and to give any other information that may be required from the settlement records.

(*b*)—ON THE UPPER SUTLEJ INUNDATION CANALS.

Duties of the Revenue Establishment on the Upper Sutlej Inundation Canals.

1. The Canal Revenue Establishment consists of the following officers :—

Patwárís. | Zilladárs.
Darogahs.

Canal Patwárís.

3. The general duties of a Canal Patwárí are as follow :—

(i). To visit all the villages in his circle and to record in his shudkar every field receiving canal water as soon as possible after the first watering. To these entries he should obtain the attestation of the village Lambardár. In case of dispute arising regarding these entries he should refer to the Zilladár for orders. Where a large area is flooded so that the boundaries of each field cannot be discerned the whole plot will be entered as one item and the detail of fields ascertained and written up as soon afterwards as possible.

(ii). To see that the distribution of water within his circle is regulated in accordance with orders.

(iii). To inspect village water-courses in his circle and to report when the owners fail to keep them in proper repair.

(iv). To report all cases of waste of water or unauthorized irrigation, making immediate inquiry into the facts of each case that may come to his notice.

(v). To keep himself informed of all changes among the owners and occupiers of irrigated land and to bring to notice any important changes that may occur.

(vi). To carry out all irrigation measurements in his circle. To prepare the irrigation khasrah for each village and write up all Tanazas or complaints against assessment. To be present at all check measurements in his circle. To prepare all khataunis and parchas for his circle, and to distribute the parchas to the individuals concerned.

(vii). To keep a diary and submit three times a month to the Zilladár an abstract of duties performed, in the form attached. And twice a month to submit an abstract of shudkar.

(viii). To copy village shujras when needed for his circle.

(ix). To explain clearly to zamíndárs all matters relating to Canal rules and to shudkar and khasrah entries, and generally to be a ready and useful referee for the people in all that relates to their irrigation assessments and liabilities.

Zilladár.

5. The Zilladár exercises a general supervision over the work of the Patwárís within his section and is responsible for its efficient performance.

His duties are :—

(i). To constantly check the shudkar and see that these have been regularly written up to date. Also to scrutinize and check the entries in Patwárís' diaries.

(ii). To send in twice a month abstracts of the shudkars in his section to the Divisional Officer for the statement of irrigation operations. Also to send to the Divisional Officer three times a month an abstract statement of duties performed by the Patwárís.

(iii). To keep the Divisional Officer constantly informed of the progress of irrigation in his section, of the relation of the demand for water in each part to the supply, and of all changes in the regulation and distribution of water that may from time to time be necessary.

(iv). To enforce strict observance of all authorized tatíls and to see that water is as far as possible regularly delivered at the tails of Canals and Rajbahas.

(v). To use his best endeavours (exercising due discretion, energy and tact) to maintain all matters connected with irrigation within his section in a good healthy working condition, and to secure a ready and willing compliance with the canal rules and when necessary to undertake the prosecution for offences under the Canal Act.

(vi). To investigate all cases of waste of water and unauthorized irrigation and to report the same for orders.

(vii). To carry out the prescribed order of the final measurements in his section and to take care that they are carried out as efficiently and expeditiously as possible.

(viii). To supervise and check the preparation of khataunis by the Patwárís and aid the Darogah in securing their punctual submission.

(ix). To enquire into and report on all cases of objections to the measurements that are referred to him by his superior officer, or received by him direct from the cultivator or that have been recorded by Patwárís.

(x). During the flood season to carefully observe and note down the limits of spill irrigation within his section reporting the results of his observations to the Divisional Officer.

(xi). To give a special training to newly appointed Patwárís so as to render them thoroughly efficient in their duties as soon as possible.

(xii). To observe and bring to notice all cases where an irrigation outlet has remained in disuse for a continuous period of 3 years or over.

(xiii). To use his best influence to settle disputes amongst joint owners of water-courses as to the just share of expense or work to be borne by each individual for clearance or maintenance of these channels.

(xiv). To keep the Divisional Officer informed regarding the rainfall within his section.

(xv). To check gauge readings as often as possible noting date, time and reading in his diary.

Darogah.

7. The Darogah exercises general supervision over all the Zilladárs in the Division and also over the Vernacular office. He is required to check a fair percentage of the measurements and to see that all the Zilladárs' records are properly kept up, and their work efficiently performed. He arranges (subject to approval of the Divisional Officer) the order in which the measurements are to be carried out. He

watches and reports progress of measurements and supervises the preparation of khataunis and revenue returns. He is also employed in important or complicated inquiries relating to disputed assessments, or to the mutual rights and liabilities of the owners of water-courses and other members of the irrigating community. His general duties are the same as those which are usually performed by a Canal Deputy Collector, but he is not invested with magisterial powers, nor is he entitled to a chair.

District Officials.

Lambardár.

8. The Lambardár is responsible to the Civil Department for the collection of the canal revenue and receives fees, amounting to 3 per cent. on the collections in the Lahore district, and 5 per cent in the Montgomery district. In consideration of these fees he is expected to pay full amount of demands into Treasury within three months, to accompany the Canal Patwárís as often as possible, when writing up the shudkar in his village, to give the correct names of the cultivators, and to sign the shudkar as evidence of his having been present. He should also invariably be present at the measurements by the Patwárís and assist in the subsequent distribution of parchas within his village. It is his duty to prevent, as far as possible, any concealment of irrigation and generally to assist the canal officials in all inquiries connected with the measurements or with irrigation within his village.

District Patwárís.

9. The District Patwárís in the Lahore district receive a percentage (varying from 4 to 10) on the owner's rate. In the Montgomery district the percentage is 0·75 on the Fluctuating Land Revenue. The District Patwárís are expected to be present at the measurements by the Canal Patwárís, the progress of which is expedited by their assistance. The District Patwári is also expected to inform the Canal Patwári from time to time of all changes in the ownership of lands irrigated from the canal, and to give any other information that may be required from the settlement records.

G.

Rules of the Irrigation Department as to the formation of plots (Kiaris) in fields.

No, 1040 I., dated Lahore, 8th March 1883.

From—The Joint Secretary to Government, Punjab, Public Works Department, Irrigation Branch,
To—The Senior Secretary to Financial Commissioner, Punjab.

In reply to your letter No. 1193, dated 23rd February 1886, I am directed to say that instructions on the subject of the division of fields into plots or *kiaris* were drawn up in the beginning of 1885 and translated into Urdu and Gurmukhi for general distribution to cultivators.

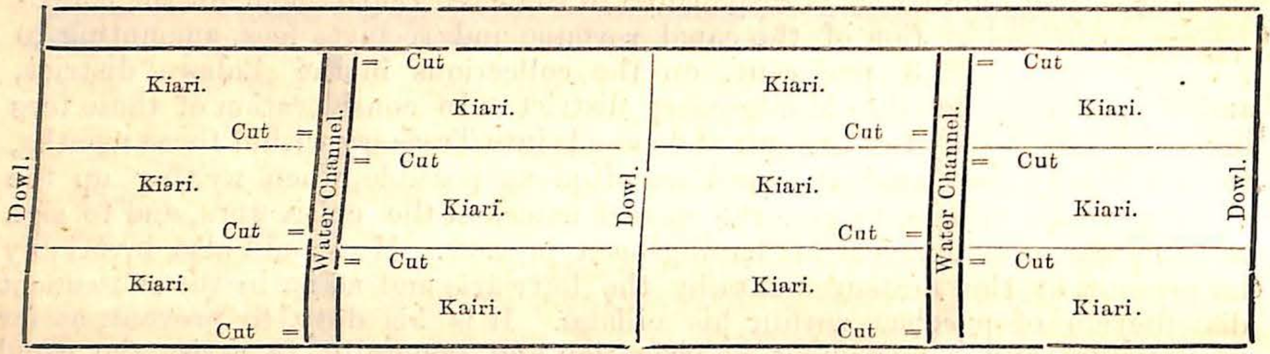
2. There are at present no spare copies in the vernacular in store, but more are being lithographed. A copy of the instructions in English is, however, put up for the information of the Financial Commissioner, and I am to remark that from Rule II it will be seen that the area of a plot or *kiari* is not to exceed one kanal.

Translation of Notice for the method of making the "kiaris."

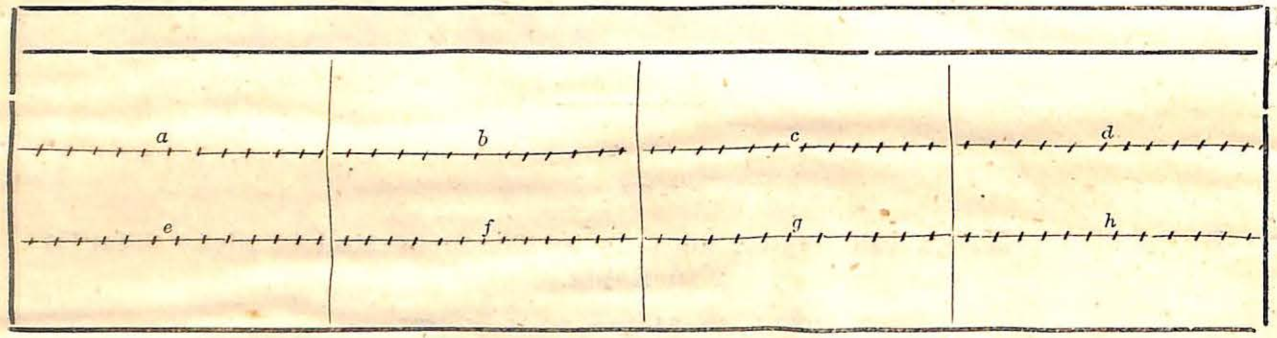
1st.—It is laid down in Rule 9, under Act VIII. of 1873, that *kiaris* should be made in all classes of fields except those for rice and garden, and that each *kiari* should be irrigated by means of a small water-channel, in the same manner as the irrigation from a well is done.

2nd.—In the above Rule the dimensions of a *kiari* were fixed at 36 × 36 feet, or about $4\frac{1}{2}$ gatthas square, which is equal to about $5\frac{1}{2}$ marlas. It is, however, now ordered out of consideration for the zamíndárs that the *kiari* be made of 1 kanal, the dimensions of the sides are not fixed absolutely, but they must be such that the area of a *kiari* shall not exceed 1 kanal.

3rd—Every *kiari* must have a water-channel on one side of it, from cuts in which water can be delivered direct into each *kiaris*. *Kiaris* will not be considered according to rules if they have not a water-channel on one side, as is shown by way of example in the sketch below :—



4th.—The zamíndárs should make water-channels in such a manner that *kiaris* of the size ordered can be afterwards formed in their fields by merely adding *dowls*, and the irrigation of each *kiari* can then be made by a cut in the water-channel as shown above. The area of each *kiari* should not exceed 1 kanal, and the water-channels can, wherever possible, be made on the divisions of the fields, and in such cases they will be permanent and no cultivator will feel any trouble in future crops. If the *kiaris* in a field are made as shown in the sketch below so that there is not a water-channel on one side of each, the *dowls a. b. c.*, &c., shown below will be useless, and the area of the kiaris will be reckoned as if such dowls had not been made.



5th.—Before making the dowls a cultivator can give *paleo* (or 1st) watering in his field if the water-channels have been properly made, and the *dowlas* can be made after the seed is sown. The *kor* (or 2nd) watering will be given after the *kiaris* have been made according to the instructions.

6th.—If *paleo* water be given to a field before making water-channels as required above, or if *kor* water be given before *kiaris* are completed by throwing up *dowls*, an extra water rate of 50 per cent. may be charged after an inspection by the Executive Canal Officer, Assistant Engineer or the Deputy Collector.

7th.—If a cultivator has once been fined for not making the water-channels and refuses again to do so in the succeeding crop, the Executive Canal Officer can stop his water, and if he again irrigates after this prohibition by the Executive Engineer he can be charged with double water rate, and in addition to this can be prosecuted under criminal laws.

If a cultivator cannot understand how to make the *kiaris* and water-channels in his field, he can ask the Zilladár who will make him understand on the spot the way to make them.

SECTION II.

PERENNIAL CANALS.

A.

Remarks from the Settlement Report as to the introduction of the system of Owner's Rate in the Rohtak District.

105. In the assessment of the canal villages, the usual difficulties with which a Settlement Officer has to contend were intensified by the necessity of framing "owners' rates" under Act VIII. of 1873. When the Settlements of the old Delhi territory were commenced, it was determined that the wet and dry assessment of the lands irrigated by the Western Jumna Canal should be fixed separately, and not in a lump sum as had been the case formerly. It was also decided, after much consideration and consultation, to fix the owners' rates according to the "proportional method," that is, to make them a fixed portion of the rates for the use of water, or occupiers' rates. The law laid down that the owner's rate must not exceed the difference of the wet and dry rates adopted, and the Punjab Government laid down that it should be a simple fixed fraction of the occupier's rate; to reconcile these two orders, based on very different sets of circumstances, and to secure the full revenue of the canal tracts, fell to the share of the Settlement Officer. In his Sampla Assessment Report, Mr. Purser decided to take one-half of the occupier's rate as the nearest simple fraction to represent the owner's rate, and the same result was arrived at for the other two tahsils also; this had already been the case in Panipat, and afterwards became the case throughout the lands watered by the Western Jumna Canal in the three districts of Karnal, Delhi and Rohtak. The canal lands were assessed separately at the lump wet rates, and then at the ordinary dry rates of the circle, according to the kind of soils; the difference between the results of the two sets of rates gave the owner's rate. This was then compared with the incidence of the average occupiers' rates paid for the last ten years, and, as has been already said, the nearest simple fraction of the occupiers' rates to represent the difference of the wet and dry rates was found to be a half. But as the average Canal irrigated area of the period adopted was a good deal less than that shown by Settlement measurements, the result of the dry assessment of Settlement Canal lands added to the owners' rates calculated at half occupiers' rates on the average departmental area, failed to give the full revenue resulting from the assessment of Canal lands at lump wet rates. Even taking the Settlement Canal area and applying to it the incidence of the occupier's rate per acre on the departmental area, there was still a loss of nearly Rs. 13,000, or about 4 per cent. of the whole revenue of the Canal circles, assessing the Canal lands at the proposed lump rates. The figures may be shown as follows; those in the first column, which are taken from the Assessment Reports, ultimately underwent some immaterial modifications:—

Assessment of Canal villages.

Owner's rates.

Loss on Owner's rates.

Name of Circle.	Revenue by Lump Rates.	Revenue by Separate Rates.			Loss by Separate Rates.	Owners' Rates on Settlement area.
		Dry rates.	Owners' rates at half of average occupiers'.	Total.		
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Gohana, Central	1,89,166	1,14,319	57,406	1,71,725	17,441	63,656
" East	44,031	27,361	13,824	41,185	2,846	15,451
Rohtak	45,802	31,190	12,911	44,101	1,701	14,439
Sampla	87,023	56,169	25,934	82,103	4,920	30,548
Total ...	3,66,022	2,29,039	1,10,075	3,39,114	26,908	1,24,094

But as the owner's rate portion could not be conveniently raised, it became necessary to increase the dry assessment of Canal irrigated lands. All these points were discussed in detail in a separate report on the owners' rates, and in the orders passed on it; these papers have been printed and have been bound up with the Assessment Reports, where they may be consulted (Proceedings Punjab Government, No. 13 of October 1879). The general upshot was, that the incidence of the dry revenue on the *Canal* lands was raised from Re. 1-4-1 to Re. 1-9-0 per acre in the Gohana Central Circle, from Re. 1-4-1 to Re. 1-6-0 in the Gohana Eastern Circle, from Re. 1-4-7 to Re. 1-9-0 in the Sampla Circle, and from Re. 1-1-8 to Re. 1-4-0 in the Rohtak Circle. These rates were not of course applied to the Canal lands alone as they stood. The result of their application to the Canal lands in their dry aspect was added to the assessment of the remaining unirrigated lands of the circles, and the whole was redistributed by a single rate over all the lands, with the following result—

Enhancement of the dry revenue.

Circles.	Incidence per acre of dry revenue on whole lands of the circle.					
	Former.			Now.		
	Rs.	A.	P.	Rs.	A.	P.
Gohana, Central	1	2	10	1	5	1
" Eastern	1	2	11	1	5	5
Rohtak	1	0	7	1	1	5
Sampla	1	4	0	1	6	2

These incidences of the dry revenue cannot be called high compared with those in Karnal and Dehli, detailed in paragraph 101, but it was admitted that under the new system the dry assessment of some estates would be much above a true one, and even above what could be fairly realised from the village if Canal irrigation was entirely or perhaps very largely withdrawn, and it was ordered that such cases should be noticed in the village Note-books, and this was accordingly done. Mr. Purser was of opinion that the dry revenue of a number of villages assessed according to the new rates was much too high in any case, and a special report was submitted on them by him to the Financial Commissioner, and I was asked to give my opinion. After considering the views advanced, the Financial Commissioner agreed to reduce the dry assessments of the revenue by a sum of Rs. 1,055 in six villages, concerning which both officers were agreed, and the final demands for the Canal circles were fixed as follows:—

Final assessment of Canal villages.

Name of Circle.	Revenue finally assessed.			Incidence per acre of cultivaiton.						Percentage of Circles Revenue.
	Dry.	Estimated Owners' Rates.	Total.	Dry.			Total.			
	Rs.	Rs.	Rs.	Rs.	A.	P.	Rs.	A.	P.	
Gohana, Central	1,27,953	60,399	1,88,352	1	5	1	1	15	1	51
" East	30,950	14,151	45,101	1	5	5	1	15	2	12½
Rohtak	32,964	13,406	46,370	1	1	5	1	8	9	12½
Sampla	62,342	29,223	91,565	1	6	2	2	0	6	24
Total ...	2,54,209	1,17,179	3,71,388	1	4	9	1	14	5	100

The initial revenue is Rs. 125 less than this, *viz.*, Re. 1 in Gohana, Rs. 41 in Rohtak, and Rs. 83 in Sampla. The result of the detailed assessments is higher than that of the rates by Rs. 5,366, but the estimated income from owners' rates

is taken as Rs. 7,000 above the average deduced from the occupiers' rates of the last ten years. There is every reason, however, I think, to believe that the full sum put down as the estimate of owners' rates will be realised. Irrigation on doubt has increased of late, especially in Sampla, and the average of the last five years, is perhaps higher than that for the whole ten. The assessment of the Canal lands is, of course, more or less experimental, and the working of the new system will have to be carefully watched. Probably a certain amount of irrigation will be given up in some villages, but there are many others eager for a new or larger share, and there is no doubt that after a few years the full estimated income from owners' rates ought to be realised. The extent to which irrigation is abandoned will depend very largely on the nature of the rain-fall of the next few years. I do not myself take an unfavorable view of the ultimate success of the plan, but it will require to be intelligently worked, and it will be necessary for the Irrigation and Civil Departments to act together in the matter. Nothing is to be more deprecated than a sudden withdrawal of water to any great extent from the villages, and I would suggest that in all cases before this is done a reference should be first made to the Revenue authorities by the Canal officers.* Orders have not yet been passed on the question of the measurements of Canal lands, but it is understood that they will be effected by the Canal patwaris, assisted by the District officials. It is all important that there should be perfect harmony between the District and Canal officers in this matter at first. If hearty co-operation once prevails, no difficulties are likely to arise hereafter; if not, a good deal of trouble will certainly be found in working the system. There is one point more to note with reference to Canal irrigated villages, *viz.*, the treatment of those suffering from swamp or the development of saline efflorescence or both. After a full discussion of the question with regards to such estates in Karnal, it was determined that where they could pay only a very low and inadequate dry assessment because of the high amount of their owners' rates, due to the excessive irrigation which they are obliged to have recourse to in order to grow any crop at all, they should be settled for five years only; and the same rule was extended to Rohtak. In accordance with it the villages of Bhadauthi, Bhadauthi-Busanah, and Siwankah in Gohana, and of Zia-ud-dinpur in Sampla have received settlements for five years, and will come under re-assessment in the autumn of 1884. There should be no difficulty in effecting this then on the basis of the facts now recorded and which will be recorded from now till then. The closest attention should be paid to the spread of swamp and saline efflorescence, not merely in these villages but in all, and the results of each year's survey should be most carefully entered in the village Note-books, and where necessary, proposals for remissions or reductions of the revenue should be made. I hope that none such will be necessary, especially as drainage obstructions are about to be removed in some places; but the Revenue officer who neglects to pay close attention to this subject will incur a most serious responsibility. *(Rohtak Settlement Report by H. C. Fanshawe, para. 105).*

Owners' Rates system.

Short Settlement for swamped estates, &c.

B.

Remarks from the Settlement Report as to the introduction of the system of Owner's Rate into South Karnal.

Chapter XXII.—The Assessment—Owner's Rates and Fixed Demand.

736. *Owner's Rates—Their Nature.*—Sections 37 and 38 of Act VIII. of 1873 provide that Government may impose upon the owners of Canal irrigated land, in respect of the benefit they receive from such irrigation, an owner's rate, which shall not exceed the sum which under the rules for the time being in

* This has since been ordered by Government—*vide* Letter No. 1028 of 23rd October 1880, to Financial Commissioner, which clearly lays down the principles to be followed in all cases.

force for the assessment of land revenue, might be assessed on such land on account of the increase in the annual value or produce thereof caused by the Canal irrigation.

Under the rules in force the owner's rate would not, therefore, exceed half the increase in the net rental of the land due to Canal irrigation; and it would be levied only in those harvests in which the land had actually been irrigated from the Canal. The understanding upon which I framed my original proposals was, that the owner's rate was intended to represent that portion of the land revenue assessed upon the additional rental due to Canal irrigation. The change in system might then be represented as follows. The rent of a given quantity of land being worth a rupees without and rupees $a+b$ with Canal irrigation, and Government being entitled to half the rental as land revenue, the land would under the old system be assessed at $\frac{a}{2}$ when dry, and at $\frac{a+b}{2}$ when irrigated; while under the new system it would be assessed in the first place at $\frac{a}{2}$ in both cases, $\frac{b}{2}$ being taken in the form of owner's rates in addition to the fixed demand when the land was irrigated. Thus the whole extent of the alteration would be that the additional assessment due to irrigation would be taken only when the land was actually irrigated, instead of being demanded regularly year by year without regard to whether water had been taken or not.

737. The Government of India has, however, ruled quite lately that this is an erroneous conception of the nature and basis of owner's rates, and has substituted the following explanation. The additional rental b springing from Canal irrigation is no way due to any act of the owner, but results from the introduction of Canal irrigation at Government expense. Thus it belongs wholly to Government and is demandable by Government as Canal revenue. This being the case, a is the net rental of the land whether irrigated or dry, and the whole Land revenue is represented by $\frac{a}{2}$, there being no part of b left to assess Land revenue upon. But as an act of grace Government consents to relinquish half of b and to demand only the other half. Still this in no way alters the nature of the respective demands, nor can the half of b which is relinquished be assessed to land revenue. Thus the fixed assessment $\frac{a}{2}$ is the whole land revenue, while $\frac{b}{2}$ taken by owner's rates is Canal revenue. This ruling in no way alters the theoretical method of assessment, or the effect of the change of system upon the people, for the fixed demand is still to represent $\frac{a}{2}$ and the owner's rates $\frac{b}{2}$. In other words, the Government demand based upon half of the whole rental is to be divided into two parts; that due to Canal irrigation is to be realised in the shape of owner's rates, and the remainder in the shape of a fixed demand.

738. *Owner's Rates—Their Form.*—The first question to be decided was, whether the owner's rates should take the form of a fixed or of a varying rate, and especially of a rate varying with the occupier's or water rate. Now it is of capital importance to remember that in this tract at any rate, where the great mass of the area is cultivated by the owners themselves, and where the great majority of the tenants even who hold the remainder of that area, pay revenue and owner's rates just as if they were owners, the owner's rate, the instant it is imposed, practically becomes a part of the cost of irrigation. If a man has to pay to Government Rs. 3 more on an acre of land when he irrigates it from the Canal than when he does not, that Rs. 3 represents to him part of the cost of irrigation, quite independently of the question whether Government calls Rs. 2 of it occupier's and Re. 1 of it owner's rate or not. Now, as the worst land and poorest crops irrigated are those in which irrigation gives an additional yield only just larger than the cost of that irrigation, *any* increase in the cost of irrigation must exclude from irrigation the worst lands and poorest crops previously irrigated, as it will no longer pay to irrigate them at the enhanced cost. But an addition to the cost of irrigation carefully adapted to the amount of surplus yield due to irrigation in each case, would thus exclude from irrigation a very much smaller area than would be excluded by an all-round rate calculated to yield the same total amount.

739. To take a concrete case: suppose a villager to own and cultivate in person land of which the surplus yield, after deducting all costs of cultivation including occupier's or water rate, is as follows:—

Acres.		Surplus yield per Acre.						Difference per acre due to irrigation.		
		Irrigated.			Not irrigated.					
		Rs.	A.	P.	Rs.	A.	P.	Rs.	A.	P.
1,000	...	6	8	0	5	8	0	1	0	0
2,000	...	4	8	0	3	12	0	0	12	0
3,0C0	...	3	0	0	2	12	0	0	4	0
4,000	...	1	8	0	1	12	0		...	

It does not pay him to irrigate the 4,000 acres, and he does not do so. I now come and impose an owner's rate. His profit is Rs. 24,500 from 6,000 irrigated acres, and Rs. 7,000 from 4,000 unirrigated; in all Rs. 31,500. If he did not irrigate at all, his profit would be Rs. 28,250. Accordingly the owner's rates must bring in half the excess profit due to irrigation, or Rs. 1,625. If I distribute this equally over his 6,000 irrigated acres, I get a rate of As. 4-4 which he has to pay on every acre he irrigates, and it no longer pays him to irrigate the 3,000 acres. Supposing he throws them out of irrigation, and the owner's rate is again adjusted. It then becomes As. 13-4, at which rate even the 2,000 acres would not pay for irrigation, and so forth. But if I take an owner's rate of As. 8, As. 6, and As. 2 on the three irrigated areas respectively, or half the excess profit due to irrigation in each case, I obtain the same sum, and it will still pay him to irrigate the whole 6,000 acres. I neglect the fixed Government demand in each case, as that has to be paid however much or little he cultivates or irrigates, and therefore does not affect his proceedings. When a landlord receives rent the point is even still more marked; for the tenant will irrigate whenever irrigation will recoup him for the occupier's rate he has to pay, while an all-round owner's rate would certainly amount on some soils to more than the whole rent out of which the landlord has to pay it.

740. The fact is, that the considerations which apply to a compulsory payment do not apply to an optional one; and that though the former may well take the form of an all-round rate, the latter cannot do so without disturbing the economy of the tract. Take the case of a Khadir village. Government takes a share of the rental of the village; and for convenience sake and in order to encourage enterprise by allowing the cultivator to reap the benefit of it, fixes its demand for a term of years. Say that, that demand falls at Rs. 2-8-0 an acre on existing cultivation. Since no diminution or extension of cultivation will affect the demand, it will pay to cultivate land which yields only 4 annas an acre profit over and above the cost of cultivation. But if Government were to take Rs. 2-8-0 per acre on the actual cultivation in each year, it would no longer pay to cultivate any land that did not yield a profit of more than Rs. 2-8-0 an acre. Thus, to fix a uniform all-round owner's rate would, by excluding land from irrigation, at once reduce the Government revenue.

But this is not the only consideration. The Canal irrigation in this district is of long standing, and has been allowed by Government to assume its present proportions. As pointed out by Sir William Muir, "the presence of Canals produces a new and artificial change, both physical and social, in the country within its range. Irrigation once provided" (I would rather say established), "becomes to a great extent a necessity to the people;" and he goes on to show how the stock of cattle diminishes, the wells fall into disrepair, and the whole agricultural economy of the village moulds itself upon the altered conditions. I do not for one moment agree with those who hold that the prescriptive rights of the people to water should stand in the way of any enforced diminution of irrigation that may be necessary for the good of the tract in general; but I do not think that Government would be justified in interfering with those rights, merely in order either to enhance its revenue or to attain simplicity in its accounts. Thus theoretically, the owner's rate should vary with the amount of net profit in each case, and therefore with—(1) the soil, (2) the style of cultivation, and (3) the crop in each case; practically the nearer it approaches to

this the better; a fixed rate is not only theoretically, but also practically inadmissible.

741. As far as concerns variation with the crop, we have a scale of the sort ready made to our hands in the occupier's or water rates. The objection raised to taking these rates as our basis is, that they form part of the cost of production; while owner's rates are to represent a porportion of the rental which varies inversely with the cost of production. But this is not quite correct. The rental varies with the surplus produce after deducting the cost of production; and if the net produce increases faster than the cost of production the rental will rise also. As a fact, those very staples, such as sugarcane, of which the cost of production is highest, usually pay the highest rent. A more just objection is that the occupier's rates are intended to represent the value of the water taken for each crop, and not the net value of that crop. My estimate of the yield of Canal land in its unirrigated aspect, framed as described in § 674 *supra*, which is of course purely hypothetical, gives the following results:—

Irrigated crop.	Value per acre of one-sixth of surplus yield due to irrigation.			Half occupier's rates.		
	Rs.	A.	P.	Rs.	A.	P.
Sugarcane	4	4	0	2	8	0
Cotton	1	1	4	1	2	0
Rice	0	13	4	1	8	0
Wheat	0	15	8	1	2	0

But here sugarcane is supposed, in the absence of irriation, to be replaced by wheat and cotton in equal parts: and the enormous saving in labour and cost of cultivation that would thus be effected would bring it down much nearer to a level with other crops. In fact, sugarcane cannot and does not pay as rent the same proportion of the produce that is paid in the case of other staples. On the whole, the inconvenience of having two concurrent scales for Canal rates seemed so great, that I recommended that the owner's rates should take the form of a fixed proportion of the occupier's rates; while pointing out that a revision of the scale was advisable. The proposal was accepted; and I believe that a revision of the occupier's rates is contemplated. When this is made, it should, I think, be borne in mind that the two rates are founded upon wholly distinct basis; and a mixed rate should be fixed so that the rate, plus whatever proportion of it is to be taken as owner's rates, shall equal the value of the water needed for the crop, plus half the additional rental due to irrigation. It is true that the rate so framed will in itself represent nothing in particular; but the only alternative is a double scale.

742. *Owner's Rates—Proportion of the Occupier's Rates to be taken.*—The next step was to fix the proportion of the occupier's rate which was to be taken as owner's rates. But we must first define more exactly what we mean by the yield of Canal land in its unirrigated aspect; for this is the very foundation of the computation of owner's rates. Take the extreme case, and suppose the Canal to be closed altogether. In the course of some years the Bángar would revert to the condition it presented when we first acquired the tract. The water level would sink to 60 feet or more below the surface, rain would become much scantier and less frequent, irrigation from wells would be scanty, and the general aspect of the cultivation would, in a considerable degree, assimilate with that of the Nardak, the yield of an individual field being reduced enormously. On the other hand, suppose irrigation to be discontinued in that field only, and otherwise to continue in full swing on all sides. The general moisture of the tract would be undiminished, the water would be, as now, perhaps within a few feet of the surface, and the diminution in the yield of that field due to suspension of irrigation would be infinitely smaller than in the case first supposed. The question is, which aspect is to be adopted as the basis of our estimate of unirrigated yield? I have taken the latter throughout; and for the following reasons. Supposing a typical acre to produce Rs. 20 worth of grain if irrigated. If it were left unwatered, and irrigation were carried on as usual in the tract, it might produce Rs. 12 worth; while if the Canal were closed and the irrigation wholly discontinued, it would produce say, only Rs. 6 worth. If therefore Rs. 6 were taken as the estimated value of unirrigated produce Rs. 14 would be taken as the basis of the owner's rate; and the owner of the typical acre, by not irrigating while others continued to do so, would get Rs. 12 worth and only pay Government for Rs. 6 worth, the people who did irrigate paying among them for the other Rs. 8 worth, in the shape of an enhanced owner's rate. Assuming, as I may safely do, that the Canal will not be closed or irrigation wholly or even very largely discontinued, I have adopted the Rs. 12 as the basis for my estimates and rates for Canal land in its unirrigated aspect. It is true that part of the unirrigated rate thus fixed is really due to the presence of the Canal; but so is a portion of the rate fixed for dry land; for there is not an acre of land in the Bangar which is not in some degree benefitted by the presence of the Canal and the irrigation from it. On the other hand, the same rate cannot be applied to dry land and to Canal land in its unirrigated aspect; partly because the latter lies lower, and forming part of the irrigated mass, is moister, but still more because it includes all the manured land, all the best soils, all the finest crops, and all the most careful cultivation. Separate rates have therefore been fixed for Canal land in its unirrigated aspect on the basis just described—a basis which was formally and explicitly recognised and sanctioned by the Financial Commissioner in page xxxiii, of his Review of my Panipat Assessment Report.

743. The rates applied to soil areas give the following results:—

	Panipat Bángar.	Karnal Bangar.	Total.
Difference between irrigated and unirrigated assessments at—	Rs.	Rs.	Rs.
Proposed rates ...	71,658	13,958	85,616
Sanctioned rates ...	67,179	20,937	88,116
Average annual amount of occupier's rates, 1866-75.	1,43,124	53,422	1,96,546

My proposals were, that a general owner's rate of half occupier's rates for Panipat and one-third occupier's rates for Karnal should be sanctioned as a revenue rate; but that in the detailed assessments the proportion to be actually taken in each village should be fixed separately; no refinements being necessary, as the rate was to some extent self-adjusting, but some simple fraction, such as a quarter, four-fifths, and the like, being fixed in each case. The reasons for fixing a separate proportion for each village were as follows:—I have attempted to show that the owner's rate should, as far as practically possible, vary with the soil, the style of cultivation, and the crop. A rough approximation to crop rates had already been attained by the adoption of the occupier's rates as our basis. Detailed soil rates were, of course, impracticable: but in reserving to myself liberty to vary the proportion which owners were to bear to occupier's rates in each village, I proposed to make allowances for the diversity of soil and position which is so marked in the Canal tract. Without some such adjustment it is absolutely impossible to make a true dry assessment, which shall not either ruin villages or fling away Government revenue.

744. Take two extreme instances: suppose two villages, *A* and *B*, each consisting of 1,000 acres of Canal irrigated land on which they pay the flow rate of Rs. 2-4-0; the former, one of the finest of the high Pánípat villages, raised well out of the reach of *reh* and swamp, and held by a large and wealth Jat community; the latter, a low-lying swampy village in Karnal, with *reh* in its borders, and owned by a depressed Rájput community. *A* will yield, after deducting all costs of cultivation except canal rates, a surplus of some Rs. 8,000; leaving, after paying Rs. 2,250 as occupier's rate, a rental of Rs. 5,750 upon which to assess;

without irrigation the rental would be at the most Rs. 2,000. *B* with irrigation will yield a surplus, as before, of Rs. 6,000 at the most, leaving after paying occupier's rate a rental of Rs. 3,750 upon which to assess: without irrigation the rental would be perhaps Rs. 2,500. The figures, then, stand as follows:—

		Village A.		*Village B.*
Irrigated assessment at half assets ...	Rs.	2,875	...	1,875
Unirrigated " " ...	"	1,000	...	1,250
Difference to be realised by owner's rates	"	1,875	...	625
Amouut of occupier's rates ...	"	2,250	...	2,250

Again, if *A*, as is not unlikely, irrigates wholly by lift, it will pay the reduced occupier's rate of Re. 1-8; and assuming that the total cost of irrigation, that is labour plus occupier's rate, and therefore the net profit, is the same in both cases, the figures will stand thus—

		Village A.		*Village B.*
Irrigated assessment at half assets ...	Rs.	2,875	...	1,875
Unirrigated " " ...	"	1,000	...	1,250
Difference to be realised by owner's rates	"	1,875	...	625
Amount of the occupier's rates ...	"	1,500	...	2,250

Now, if we are to take the same proportion of the occupier's rates as owner's rates in both these villages, we must either fix such a small proportion that *A* will be absurdly lightly assessed, to the injury of the Government revenue, or we must fix such a high proportion as practically to prohibit irrigation altogether in *B*, or we must manipulate the fixed portion of the assessement so that it no longer remains a true unirrigated assessment. Of course exception may be taken to the figures of the example. But the broad fact remains that the irrigated rental is largest in the high villages where the unirrigated yield is smallest, and smallest in the swampy villages in which the unirrigated yield is greatest; in other words, that the surplus rental due to irrigation, of which the owner's rates are to represent half, varies enormously with the position of the village, being increased in high villages, not only by the irrigated rental being higher, but also by the unirrigated rental being lower than in others. Since, then, the occupier's rates are the same for both villages, or if they vary, are lowest in the high villages irrigated by lift in which the owner's rates should be highest, it is obvious that no fixed proportion of these rates can possibly give a *true* owner's rate assessment, because it cannot represent half the additional rental due to irrigation. At the same time to fix such a high proportion as should give a full owner's rates assessment in dry villages would virtually be to prohibit irrigation in wet villages—a course which, for reasons explained in § 740 *supra*, I did not feel justified in proposing.

745. It was decided by Government, however, that the inconvenience of having a varying proportion between owner's and occupier's rates was too great to be endured, more especially as the owner's rate would virtually become a part of the cost of the water to the peeple; and I was directed that the proportion must be fixed for the whole tract, the necessary adjustment of assessment due to the varying conditions of the villages being made in the fixed part of the demand. Under these circumstances I proposed that one-half should be taken throughout, although this would give considerably more than the estimated value of owner's rates, and this for several reasons; because the irrigation will almost certainly diminish slightly in Karnal Bangar under the new system, at any rate in wet years; because a slightly high rate for irrigation will do good rather than harm in the swampy villages; and because if either portion of the demand is to be raised above the standard, it is safer to raise the rates, which can always be altered at a year's notice, and which are more or less safe-adjusting in their working, than the fixed demand, which it is exceedingly difficult and inadvisable to reduce without grave necessity. It was therefore finally decided that the owner's rates should, for the present, be fixed at half the occupier's rates; and an entry to this precise effect has been made in the administration papers.

746. *Owner's Rates—Nature of the fixed demand.*—It is obvious that this decision at once does away with the principle of dividing the total demand upon the village into a fixed demand representing half the unirrigated rental, and an owner's rates demand estimated to represent half the additional rental due to irrigation; in other words, that the demand announced to the people is a *fixed* but not a *dry* assessment. Thus, directly this point was decided, it became necessary to reduce the unirrigated rate for Canal land in Karnal Bangar from Re. 1-10-0 to Re. 1-5-0; for as the land was to be assessed at an all-round rate of Rs. 2-4-0 and as half occupier's rates averaged As. 15 an acre, only Re. 1-5-0 remained to represent the fixed demand, though Re. 1-10-0 of course represented as before the true dry demand. It is because I wish specially to bring out this point forcibly and clearly, that I have dwelt upon the nature of my original proposals, and upon the orders passed on them. Those proposals were framed on the understanding that I was bound to fix in all cases a true dry assessment, added to which the varying owner's rates would give the total assessment. The final decision was that the owner's rates were to be fixed; and that in case in which those fixed rates would probably fall short of or exceed the true additional demand due to irrigation in each village, the difference was to be added to or deducted from the fixed part of the demand. The latter method is far more uniform and simpler in its working; the only difficulty it presents is the necessity for revision of the fixed demand in certain vlllages, in the event of the supply of water being materially circumscribed or the rates materially enhanced; and in very many villages there is practically no difference between the fixed demand arrived at under it and a true dry demand. All I wish to insist upon is, that the fixed demand is by no means *necessarily* a dry demand; and that the circumstances of the individual village must be examined before it can be assumed that no enforced reduction in irrigation will affect the ability of the village to pay its fixed demand. And it is necessary to insist upon this point, because the Canal officers are most properly aiming at a gradual reduction of the excessive irrigation which is too common in the tract, and they have understood that the new demands are *báráni* or dry demands, and that they may accordingly set them wholly aside in considering the question of irrigation. The measures that have been taken to assist officers in determining the question of future reduction of irrigation and demand are detailed below in § 779.

747. *Owner's Rates—The detailed assessment.*—Thus the general principle on which the detailed assessments have been framed is as follows:—The total burden which a village can bear has first been assessed on the old principle, without any reference to owner's rates. The probable amount which the village will have to pay in the form of owner's rates has then been deduced from the figures for past occupier's rates, viewed in the light of the present circumstances of the village, and the difference between the two amounts has been announced as the fixed demand. Thus, to revert to our original example of the two extreme villages described in § 744, we have the followiug figures:—

		Village A.			*Village B.*
Total assessment	Rs.	2,875	...	Rs.	1,875
Half occupier's rate	"	1,125	...	"	1 125
Differencc, or fixed demand announced	"	1,750	...	"	750
True dry demand	"	1,000	...	"	1,250

or, if *A* irrigates by lift only—

		Village A.			*Village B.*
Total assessment	Rs.	2,875	...	Rs.	1,875
Half occupier's rates	"	750	...	"	1,125
Difference, or fixed demand announced	"	2,125	...	"	750
True dry demand	"	1,000	...	"	1,250

In the case of *A* and similar villages the difference of Rs. 1,750 or Rs. 2,125, according as the irrigation is by flow or lift, has been announced as the fixed demand; but, as the true unirrigated assessment of the village is only Rs. 1,000, it is obvious that the fixed demand really includes a large portion of the demand due to irrigation, and could not possibly be paid if the irrigation were appreciably reduced. And the figures of the example are by no means exaggerated, though of course such villages are exceptional. Take the

village of Israna, the most marked example in the tract. It cultivates 2,250 acres, of which it irrigates only half, and that wholly by flow, and it has no wells. I assessed it at Rs. 7,500; and as half occupier's rates only amounted to Rs. 1,300, I announced a fixed demand of Rs. 4,400. But without irrigation it most certainly could not pay more than Rs. 2,250. Applying the same method to village *B*, we find ourselves confronted by a new difficulty, for the fixed demand given by the figures is only Rs. 750, while the true dry assessment is Rs. 1,250. Thus, if we announce Rs. 750, the village has only to relinquish irrigation to pay Rs. 500 less than it ought to pay to Government; and here too the figures of the example, though representing very exceptional cases, are so far from being exaggerated that they actually fall short of the facts in some villages, where half average occupier's rates actually *exceeded* the total assessment which I thought the village able to bear, so that the fixed demand given by my figures was a minus quantity.

748. The fact is that the figures for occupier's rates, based as they are upon the actual payments made by each village between 1866 and 1875, are not, in the swampiest villages, a wholly satisfactory basis for an estimate of the probable future owner's rates demand. In the first case they include a rate called *sailabi*, which has hitherto been charged upon spring crops not themselves irrigated from the Canal, but immediately following rice which has been so irrigated; and in very bad villages where nothing but rice will grow in the autumn, and spring crops must be sown after it for fodder, this rate forms an appreciable proportion of the whole, insomuch that in some of the worst villages the average area on which water rates had been levied was 130 per cent. of the whole cultivated area. The rate has just been ordered to be discontinued for the present, though I believe the question of its imposition is by no means finally settled. Again, the figures include water rates paid upon a certain area of land which has since become unculturable owing to the spread of *reh* and swamp; and, finally, there can be little doubt that in many moist villages, the enhanced cost of irrigation under the new system will lead the people to contract their irrigation, in some cases probably to a considerable extent. At the same time, it was, as pointed out by the Financial Commissioner in his orders upon my Panipat Report, necessary to exercise "great caution in calculating in advance on the discontinuance of the use of Canal water in water-logged villages in consequence of the lightness of the fixed assessment." The soil of such villages has been described as a sponge which holds up the plants, while they draw such nutrition as they do derive from the Canal water alone; and the description is exaggerated rather than untrue. Moreover, many of the worst villages are so wet that nothing but rice can be grown in the autumn; and though when the rains set in, water is plentiful without irrigation, yet canal water must be taken to start the crop; and when once taken, full rates are charged. These considerations are much less forcible in those few villages in which a good many wells still exist in fairly good order, irrigation from which could be substituted for irrigation from the Canal. But even here, too much stress must not be laid upon the existence of the wells; for it will in many cases need both time and capital to put them in working order, and to procure the oxen necessary to work them.

749. To meet these cases I adopted the two following principles: *first*, that the fixed demand should never fall below such a moderate dry demand as I felt certain the village could pay, even if irrigation were wholly denied it; *secondly*, that though the greatest caution was needed in discounting beforehand a probable decrease in irrigation, yet in villages whose history and circumstances rendered it practically certain that irrigation would in future reach the old figures, only in the event of such a reduction of swamp and consequent improvement in the condition of the village taking place as would fully compensate for the increased burden, it was not only possible but necessary to make allowance for the facts, and to raise the fixed demand, even when it was already above the true dry demand, to a higher figure than that obtained by the deduction of half the full occupier's rates of past years. The application of the first principle was called for in only a very few villages; the second was more often applied, especially in Karnal, but even there the villages falling under it were

comparatively few. The method of assessment adopted by me was formally approved of by Government in its orders upon the Rohtak Revenue Rates Report, where the question will be found discussed at some length; and in its No. 1172 of 30th October 1879, conveying final orders upon my Panipat Assessment Report.

750. *Owner's Rates—The Term of Settlement.*—The uncertainty as to what the future burden of owner's rates will be under the new system, necessarily produced a corresponding uncertainty in the detailed assessment. We had introduced a radical change into our system, but had nothing to guide us in fixing the future demand save the facts of its working before the change; we had raised the cost of irrigation by 50 per cent., and had nothing to guide us as to the result but the irrigation figures before the rise. And these figures, which depend upon the kind of crops sown and the amount of double-cropping as much as upon the mere area irrigated, varied in the most extraordinary and apparently arbitrary manner, one village having paid as much again in the shape of occupier's rates as another apparently precisely similarly situated. At the same time they afforded the only safe basis—indeed the only basis—which we had to work upon. It would have been unsafe in the extreme to found the assessments upon mere estimates, and to assume on the strength of all round-rates, that a village would in future pay much less or much more than it had paid in the past. Thus the fixed assessment, not being in fact an assessment at all, but only the amount remaining from an assessment after deductions which are more or less fixed for us by past figures, presents an appearance of great inequality; and as the villages adjust their irrigation under the new system, the inequality may become real. But it can only assume the form of a too low, and never of a too high fixed assessment; and if a low fixed demand induces swampy villages to reduce their irrigation, the temporary loss of revenue will be more than compensated for by the general improvement of the tract. The adjustment of the fixed demand was rendered still more difficult by the fact that the whole machinery of irrigation is just now in a state of flux. The old Canal and its distributaries are being replaced by a new system, part of which has just come into action. It is certain that the change, when complete, will very largely modify the condition of individual villages, while it is impossible to foretell the nature or extent of that modification. It was dangerous to count upon any future amelioration, except in the very few cases in which its occurrence was certain; it was impossible to allow for future injury which was only probable. Thus the circumstances were difficult; and all I could do was to assess to the best of my judgment the villages as they stood, to point out very clearly what dangers were to be apprehended, and in what direction care was necessary in the future, and to put on record such facts as might be useful hereafter. My attempts to do this are described in § 779 *infra*.

751. *Five-yearly Revision of Assessment.*—Under these circumstances the Financial Commissioner suggested that it might be well to settle the Canal tract for 15 years only. The foregoing remarks will have shown how very much there was to be said in favour of the proposal. It is almost certain that 15 years' working of the new system will disclose inequalities in the fixed assessment. The assessment could not possibly be enhanced during currency of settlement; and even though reductions can theoretically be given at any time, it requires in practice very great pressure indeed to bring them into the ordinary district routine. On the other hand was the fact that the people had suffered for 38 years, that the improvement would be for the most part very gradual, and that if care was taken to give reductions when really necessary, the enhancement of the fixed demand (for the owner's rates would rise of themselves as irrigation extended) might well be postponed as a slight set-off to the tardy and insufficient nature of the former relief. And on general grounds, the shortening the term of settlement was of course objectionable if it could be avoided. The Government finally directed that the term of the settlement should be for 30 years; but that Government should reserve discretion to revise at the end of each five-yearly period the assessment of those villages in which the fixed demand fell short of the true dry assessment of the village.

752. As already explained in § 749, I had endeavoured so to frame my assessments that in no village should the fixed demand fall below a moderate

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dry assessment. But when re-considering the assessment of each Canal village in connection with the question to be discussed presently of future reduction of Canal irrigation, I selected the five villages of Begampur, Rer, and Kutana in Tahsil Karnal, and Baholi and Wazirpur Titana in Tahsil Panipat, and inserted in their administration papers a clause securing to Government the power of five-yearly revision. They are all swampy villages of the most aggravated description, in which the cultivators have been reduced to abject poverty by injury from the Canal unaccompanied by sufficient relief; and in assessing them I had been obliged to consider what they could pay in their present abnormally depressed condition, while leaving room for them to recover themselves. I do not think it would have been wise to have demanded, in the first instance, more than the very moderate fixed demand I imposed; but it is almost certain that they will improve rapidly under a moderate assessment, and especially if, as is probable, the realignment of the Canal relieves them of their swamps; and that their assessment is lower in relation to their mere physical capacity, than that of any other villages in the tract. But in reporting my action, I pointed out that when the time came for deciding whether the demand should be enhanced or not, great care must be taken not to base any increase upon the results of a dry season only, as villages of that sort often yield in a year of drought several times as much as is obtained from them on the average of varying seasons. The Financial Commissioner approved my action, and directed that when the question of revision came up, attention should be paid to the above remarks.

753. *Incidents attached to Owner's Rates.*—It has been provisionally decided, subject to the final orders of the Govenment of India, that all cesses will be levied upon owner's rates as though they were land revenue. It has also been ruled that no allowances to *zaildárs* or chief headmen will be made out of this rate. I am afraid there is a little confusion in the minds of the people about the true nature of owner's rates. When announcing the new demands, I explained that these rates represented that part of the land revenue due to Canal irrigation. Since the new ruling was communicated to me, I have endeavoured to explain that I was mistaken; but I have had no opportunity of correcting my announcement as publicly as it was made, while the fact that cesses are levied on the owner's rates as on land revenue, and not levied on the occupier's rates which they understand to be Canal revenue, makes it difficult for the people to appreciate the distinction now drawn.

It has been decided that owner's rates, not being land revenue, go to Government, whether the land on which they are levied is assigned or not. But the Punjab Government, in its No. 1365, of 18th December 1879, sanctioned the exemption from these rates of all Canal irrigated land in the city of Panipat, on the ground that the whole city area is held revenue free, or on a permanent quit rent; and that it enjoyed Canal irrigation at the date of the grant. The question whether the Mandals and other assignees of land reveuue whose lands were not so irrigated at the time of their first assignment, shall or shall not receive compensation for the loss of income caused by the separation of these rates, is now under the consideration of Government.* (*Karnal Settlement Report by Ibbetson, Chapter XXII.*

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771. *The Bangar—Reduction of Irrigation.*—In the Bangar circles everything will depend in the future, as it has depended in the past, upon the Canal. I have already described the immoderate irrigation which has been so long practised in this tract, and to which I believe the evils from which it has so severely suffered to be in great measure due. Nothing is more imperatively necessary than that some check should be placed upon the inordinate abuse of Canal water. But I think that there are many points which must be taken into consideration in determining the manner in which this check is to be imposed. I have stated that all land actually watered from a well at or about the time of survey has been entered and assessed as well irrigated, although it may also be irrigable or irrigated from the Canal. Under § 39 of the Canal Act this land is exempted from the incidence of owners' rates—an exception which seems to me not only un-

* Note.—I believe it has since been decided that the Mandals are to receive the owner's rates of all villages which were irrigated at last settlement.

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necessary but pernicious, as it puts a premium upon the substitution of a more or less injurious for a wholly harmless mode of irrigation. Moreover, the method of distribution of revenue adopted by the people has, as explained in § 645, reduced it to a nullity. Orders have been issued to deny Canal water to all such land; and in this way a certain small reduction in irrigation will be effected in a perfectly unobjectionable manner.

772. The case of land which may be considered to be protected by existing wells, but which has been all along irrigated from the Canal and has been recorded and assessed accordingly, is very different. It has been proposed to deny Canal water to this land also. But it will not be possible for the people in most cases to work these wells at once. Stronger cattle will be needed, and more of them; and the wells themselves in most instances need repairs—often expensive repairs. Now that the cost of Canal water has been increased by 50 per cent, it is pretty certain that where wells can be worked they will be worked, though a little time will be needed to make arrangements. If it is eventually found that Canal water continues to be taken for land which is really protected by a well fit for use, it would be wise, I think, to refuse to supply it. But the circumstances of each case should be carefully considered, and no general rule or average applied. It was proposed to refuse water to a large part of the city of Karnal because the area contained sufficient wells to irrigate the whole at an average estimate of 20 acres per well. But setting aside the question whether all the wells were really fit for use, it was found that, as a fact, very few of the wells had so much as 20 acres attached to them, the wells being, as often happens, crowded into the best part of the area, each well-owner holding a smaller area than the well could really irrigate, and the remainder of the area being without wells.

773. Again, it has been proposed to limit the proportion of the area of each village to which water will be supplied, and especially to refuse water altogether to swampy villages. In the first place, it is certain that under the new system irrigation will be reduced to some extent; and I believe that the reduction will be considerable. Especially the swampy villages, in which a light fixed demand has been imposed, will find it to their advantage to contract their irrigation, and so avoid paying owners' rates in addition to the fixed demand. Moreover, very much has been done, and is still being done, to relieve the tract. The opening up of drainages has already been attended with marked advantage, and will, when complete, change the whole aspect of some parts of the country. The curtailment of the supply of water by substituting delivery pipes for masonry openings, though I suspect that the allowance as at present fixed is too small and in many cases involves real hardship, does great good by teaching economy in the use of water; and no doubt as the system is completed and experience gained, more attention paid to the requirements of individual villages will remove all grounds for reasonable complaint. The new rules about bedding out irrigated fields will also greatly reduce the waste of water; and the new system of distribution which will be set in operation directly the Canal is open will in numberless ways work a change for the better in the condition of the Canal tract. Under these circumstances I would urge that before any heroic remedies are adopted, we should wait to see how far the improvements we have introduced and are still introducing will supersede the necessity for more sweeping measures, which must of necessity be productive of great individual suffering.

774. Especially I would demur to the immediate refusal of Canal water to swampy villages. In the first place, it is not the amount of water taken by the village itself that makes it swampy. It lies in a drainage line; the whole neighbourhood is water-logged; the rain water instead of sinking in when it falls, runs off and fills the hollows, and the actual irrigation of the village itself can have only the very smallest influence upon its condition. Again, as I have before remarked, much of this swampy land will grow nothing worth growing without water, and as a village is seldom wholly swampy, there is, if water be denied to the swampy fields, all the greater need that a full supply should be given to the higher portion of the cultivation. Finally, in many of these villages in which swamp has been most largely developed, the cultivation left to the people bears such a small proportion to their number that anything that reduces the yield must render it insufficient for their support. The following

are the *average* figures for some of the worst villages. Of course individual holdings are often smaller still :—

Name of village.	Percentage of present cultivation on that of 1842.	Cultivated Acres.		Annual net produce per adult male agriculturist at 5 times Government Revenue.
		Per soul.	Per adult male agriculturist.	R. A. P.
Phurlak	80	0·6	3·6	41 4 0
Kambohpura	57	0·6	3·0	31 10 0
Dadláná	38	0·6	2·7	24 1 0
Raipur	90	0·5	2·6	27 10 0
Asan Kalán	75	0·6	3·2	41 0 0
Alupur	102	0·5	2·7	37 0 0
Baholi	42	0·7	3·8	44 2 0
Madlauda	63	0·5	2·9	51 11 0

Out of the money entered in the last column all the costs of cultivation have to be met, including occupiers' rates ; and the cultivator and his family have to be supported.

775. I hope I shall not be misunderstood. I admit that the evil is so great as to justify almost any measures that would secure its removal ; and that if this end can be secured in no other way, the interests of individual villages must be disregarded when they conflict with the good of the tract as a whole. But I believe that the new system of owner's rates and the new alignment of the canal will of themselves secure almost all that that is needed, or if not, will at any rate go a very great way towards it. I am sure that if we only let the people gradually reduce their irrigation for themselves, the reduction, so far as it goes, will be effected with infinitely less economical disturbance, and will be attended by infinitely less hardship to individuals, than would ensue if the same reduction were effected by theaction of Government ; and I do not think that it will be wise to wait a few years, and see how matters stand when the new system has got fairly into train, before we resolve upon an interference in which innumerable details with which we cannot possibly be acquainted must of necessity be disregarded. And I would deprecate the general application of any broad general rules, estimates or averages ; for the circumstances and requirements of the villages vary from one to another, and nothing but local knowledge can foretell the effect of a general measure in individual cases. Were Canal irrigation being introduced for the first time, the case would be very different. But we have allowed the present system of irrigation to grow up under our authority and sanction ; indeed, I have no hesitation in saying that, before its evil results became apparent, we actively encouraged it by our very natural endeavours to increase our Canal revenue; and we are bound to retrace our steps as gently and with as much consideration for the interests which we have created as is compatible with our duties to others.

776. Finally, I would deprecate, for the next two or three years, the enforcement of the rule laid down in No. 160 J. of 12th January 1874, from Secretary to Government, Irrigation Branch, that a village not taking water for two years should *ipso facto* lose all claim to its supply in the future. The owner's rates are a new experiment—new to the people at least. It will be necessary for them to try the new conditions under various circumstances before they decide what degree of irrigation will best repay them at the enhanced price. I think that for a time they should be allowed every possible freedom in making these experiments, and that a village even which resigns its claims to water should not be held to have forfeited it, as has been held in some instances. The Canal officers say, "we have been longing for years to refuse water to that swampy village. Now that it has given us the chance, why should we not take advantage of it." I think that in enforcing the rule I refer to, they only defeat their own aims. A village dare not give up water if it feels that by doing so it loses

all chance of getting it again. I believe that if for the next four or five years the people were encouraged to reduce irrigation, and assured that they should have the water again if they wanted it, the evental reduction of irrigation would be greater than could be arrived at in any other way. It is perfectly true that, as the Financial Commissioner remarked, the people cannot be allowed to retain a lien on water to be used only when it is most valuable; but the liberty I propose would not be permanent. The irrigation will, for a few years to come, be passing through an experimental stage ; the results will undoubtedly be to reduce irrigation ; and I believe that the greater the liberty of experiment given, the greater will be the reduction finally arrived at. I am quite aware that there is no legal right to a supply of Canal water. I refer only to that equitable right which has been so often recognised and insisted upon by the Punjab Government.

777. *Reduction of assessment consequent upon reduction of irrigation.*—It may in some villages be determined to reduce the supply of water, or rather the area to which Canal water is to be supplied. And even if an attempt be made to irrigate in every case the same area which was formerly irrigated, it is all but certain that, in the remodelling of the whole scheme of distribution, some cases will occur in which it be impossible to effect this object. In many villages irrigation might be reduced to almost any extent, and the fixed demand would still not be too heavy. But in very many villages any material circumscription of the irrigated area will entail a corresponding reduction in the fixed demand. As I have already explained the fixed demand is, in *most* cases, *not* a dry demand ; but includes a part, often very considerable, of the assessment upon irrigation and which cannot be paid without that irrigation. As the Financial Commissioner said in reviewing my Panipat Assessment Report, " it will certainly be necessary to revice the fixed assessment now being made on these principles in high and dry Canal villages if their supply of Canal water be ever hereafter seriously reduced, for owing to the fixity of the proportion of the occupier's rates to be taken as owner's rates, the dry assessment in such villages will not be a true dry assessment, but only the balance of a half assets assessment on the old fixed system after allowing for the sum to be taken as owner's rates calculated at half occupier's rates." But even this, I think, falls short of the whole truth. As explained in § 742 *supra*, my fixed demand, being framed to suit individual fields ceasing to irrigate, and not whole villages without irrigation, includes in *almost all* villages and not only in those which are high and dry, a portion of the irrigated assessment for the whole village—a fact explicitly recognised by the Financial Commissioner as quoted in that paragraph. Thus, *theoretically*, it is only in villages referred to in § 749 in which a true dry assessment has been made that the fixed demand is independent of irrigation. But of course in very many more villages irrigation might be very considerably reduced in practice without entailing a reduction of demand ; while it is only in those in which the fixed demand is high in proportion to the true dry assessment, that any reduction whatever of irrigation would leave the fixed demend too heavy.

778. In its final orders on the Panipat Report, Government remarked :— " It may be necessary, if water is withdrawn hereafter, to give reductions of the dry revenue assessed on some estates ; but this cannot be told with certainty until the distribution of the revenue over the village lands has taken place, after which it will be possible for the Settlement Officer to note how far he considers the dry assessment to be too high." I would venture to submit that no method of distribution can affect the ability of a village to pay without irrigation, an assessment of which a considerable portion is based upon, and only justified by the existing irrigation. Take the village of Israna, quoted in § 747. That village has 2,250 cultivated acres, of which half are irrigated. Its fixed demand is Rs. 4,400. It would be absolutely *impossible* for it to pay anything like this sum without irrigation ; and *any* sensible reduction of irrigation will entail a reduction of demand. It has distributed its assessment evenly over its cultivated area, at the rate of, say, Rs. 2 an acre, so that a man owning ten acres, will pay Rs. 20. But this will be possible only because irrigated and unirrigated land are distributed with tolerable equality among the owners, so that, roughly speaking five of his ten acres will be irrigated,and five unirrigated, and a great part

of the Rs. 10 which falls on the five unirrigated acres will be paid out of the profits of the five irrigated acres. If the people had imposed Rs. 3 on irrigated and Re. 1 on unirrigated land, it would still have been as impossible for the owner of the ten acres to pay his Rs. 20 if water had been refused to two of his five irrigated acres, as it would be in like circumstances under the present distribution.

779. I have, in accordance with the directions of the Financial Commissioner, carefully reviewed my assessment of each village of the Canal tract, have estimated roughly how much of the fixed demand I consider to be assessed on the present irrigated area, have tabulated this assessment, its incident upon the Canal area, the area shown as Canal irrigated, and the average past irrigation, and have classified the villages according as reduction of irrigation might be made to a greater or less extent without entailing reduction of demand. The general result was, that in 23 villages the fixed demand could be paid without irrigation at all; in 43 more, irrigation might be very considerably, and in 13 more, less largely circumscribed without necessitating revision of assessment; in 21 more any very material reduction of irrigation would call for corresponding relief; while in the remaining 36 the fixed demand was so high that it could not be paid in full unless the supply of water was kept up, practically speaking, to the present standard. The result of this review has been added in the form of a "Canal note," at the foot of my assessment remarks in the village Note-book of each village, and should be of use if the question should arise in the future. But it must be remembered that my remarks are based upon the present condition of the tract; that it is quite impossible to foretell what effect diminution of irrigation will have upon any estate, especially when combined with the wholesale remodelling of the Canal system; and that a village now advantageously moist may be left by the change of Canal so dry, that its fixed demand may become higher in proportion to its true dry assessment than I now consider it to be, or *vice ersa*. Too much caution cannot be exercised in acting upon such opinions, formed as they were under circumstances other than those to which they may have to be applied. And it must be remembered that my remarks apply only to the fixed demand, considered with reference to the physical capacity of the village to pay revenue. The important question of the effect of reduction of irrigation upon the capability of the village to support its inhabitants was not taken into consideration, as it did not fall within the scope of inquiry.

780. *Reduction of demand consequent upon change of flow for lift irrigation.*—The fixed demand having in many villages taken the form of the balance of the total assessment after deduction of owner's rates, estimated upon the basis of past occupiers' rates, it is obvious that, where that balance is in excess of the true dry assessment, any future substitution of flow for lift irrigation should, in theory, entail a reduction in the fixed demand of the exact amount by which the change will enhance the owners' rates demand, so as to leave the total demand unaltered. Take our typical village *A*, discussed in § 744. The respective assessments, supposing *A* to irrigate by flow and lift, will be as follows :—

	By flow. Rs.	*By lift.* Rs.
Surplus, after deducting cost of dry cultivation and labour of flow irrigation	8,000	8,000
Occupier's rates	2,250	1,500
Extra labour of lift irrigation	...	750
Net profit	5,750	5,750
Assessment at half assets	2,875	2,875
Deduct owner's rates	1,125	750
Fixed demand	1,750	2,125

It is here assumed that the gross yield of flow and lift irrigation are equal; if there is a difference it is in favour of lift irrigation, as water is used with greater moderation when it has to be raised, while land which can only be irrigated by lift is generally raised well out of the reach of injury; insomuch that "*dal ka samana*," or land watered by lift, is often used by the people as synonymous with land free from *reh* and swamp. It is also assumed that the cost of the additional labour necessary for lift irrigation exactly equals the reduction in the rates, for the rates are adjusted with this view. But in reality the labour set free by a change from lift to flow irrigation can hardly be utilised in any

profitable manner; and the chief difference between the two cases is, that in one the men have more useless leisure than in the other. But even accepting these two assumptions, it is still obvious that if our village, irrigating by lift, is assessed at a fixed demand of Rs 2,125, and the whole irrigation is then changed from lift to flow, the fixed demand should be reduced to Rs. 1,750, so as to leave the total assessment unaltered. The enhancement of the occupier's rates due to the change is supposed to be compensated for by the saving in labour; but it remains to compensate the village for the enhancement of the owners' rates, which is simply due to the accident that those rates, being of the nature of assessment, vary with rates which represent cost of water.

781. But of course only a few villages do irrigate a large proportion of their area by lift; small changes would need no allowance; and where the fixed demand is already moderate in relation to the true dry assessment, no reduction would be needed. I have therefore, in the course of the review described in § 779, selected those villages in which a reduction would appear to be needed in the event of flow being substituted for lift irrigation to any considerable extent; and I have calculated and shown opposite each the amount of reduction which would be entailed by the whole of the lift irrigation being so changed. Proportionally smaller changes, if they are sufficiently considerable to call for any reduction at all, will entail proportional reduction. This information has been added to the Canal note already mentioned as having been entered in the villags Note-books There are only 22 villages in which this point is worthy of consideration; and if the whole lift irrigation in the tract were changed to flow, the total consequent reduction in fixed demand would be only Rs. 3,550. Of course, exactly the same considerations which would render a revision of the fixed demand necessary in some few villages, if a change in the nature of the irrigation should raise the occupier's rates, will necessitate a similar revision in all those villages in which the fixed demand differs materially from a true dry assessment, in the event of the general scale of occupiers' rates being either raised or reduced.

782. *Rents and Owners' Rates.*—The Punjab Tenancy Act was framed before the owners' rate system had been introduced. A good deal of the Canal Act is more easily applicable to a Canal just going to be started than to an old established system of irrigation; and both are based upon an accidental conception of rent which is at present very foreign to the ideas of the people in these parts. I fear some little difficulty will ensue. To begin with: we have the anomaly that it practically lies with the tenant to determine the amount of rates which are payable by the owner. Suppose a landlord has five acres of land cultivated by a tenant. Under the old system it was assessed at Rs. 2-8-0 an acre, and the tenant, as usual, paid the revenue only, amounting to Rs. 12-8-0, I have now assessed it at a fixed demand of Re. 1-8-0 an acre, or Rs. 7-8-0 in all, on the supposition that the owners' rates will average Re. 1 an acre, more. Now, if the tenant is allowed to continue to pay revenue as before, he will perhaps be held responsible for the owner's rate also; though I know at present of no legal authority under which the landlord, who is by law primarily responsible for it, could exact it, at any rate now that it has been ruled not to be land revenue.* But in many villages the landlords have refused to allow their tenants the advantage of the reduction in the fixed demand, and have insisted upon the full Rs. 2-8-0 an acre as usual. If then the tenant sows sugarcane only in the whole of the five acres, which he can easily do if he owns other land also of his own, the landlord will have to pay an owner's rate of Rs. 2-8-0 an acre, while he will receive from the tenant only Re. 1, or the difference between the old and new fixed demands. In fact the tenant can concentrate his best crops on the land held in tenancy rather than on his own land, and cultivate them in great part at the expense of the landlord.

783. If the tenant has no rights of occupancy, some sort of yearly agreement and account will be necessary—a proceeding very foreign to the present practice of the people. If he has rights of occupancy, the Local Government has power to impose some part of the owner's rate on the tenant under § 41 of the Canal Act. But no rules have yet been issued; and whatever proportion of the rate is

* Since I wrote the above, rules have been framed under the Canal Act to regulate the respective responsibility of owners and occupancy tenants for owners' rates.

thrown upon the owners, it will still remain for the tenant to decide at pleasure whether the rate, of which the owner will pay a proportion, shall be Rs. 2-8-0 or Re. 1-2-0 an acre.* If the rule of the Local Cess Act is followed, a rule never yet acted on in the tract, as all occupancy tenants have hitherto paid revenue and cesses only, the Patwari will have to decide, when he draws out the half-yearly *bachh* papers, to what extent the rent of each occupancy tenant is favourable; and when the amount of rent is disputed (and at the present moment it is disputed I believe in every individual case) he will be in a difficulty. No decree for enhancement under the Tenancy Act would seem possible, as the customary rent paid by tenants-at-will in the Canal tract is revenue and cesses only. I firmly believe that, in the course of some years, the rent paid by tenants-at-will will be raised pretty generally, as I have explained clearly to the owners that this is an essential preliminary step to their deriving any profit from occupancy holdings owned by them. But till this change has so far progressed that a custom has been established under the Act, no enhancement is possible. I have advised the owners to let the occupancy tenants for the present pay the new fixed demand and the owners' rates, and eventually to sue for *malikáná* in addition; and this is the only method I can discover by which serious difficulties would be avoided. Whether they will follow my advice remains to be seen. The rise in the rents of tenants-at-will, will, I fear, cause some distress at first; for a large proportion of the tenants' holdings are so small that any encroachment upon the profit they derive from them will render it insufficient to support them, and they will in many cases have to give up the land. (*Karnal Settlement Report by Ibbetson, paras.* 771—783.)

C

Judgment of the Chief Court as to the division of owner's rate between landlords and tenants in certain cases.

No. 88.

AHMAD SHAFFI,—(PLAINTIFF),—APPELLANT,

Versus.

DANI,—(DEFENDANT),—RESPONDENT.

Civil Case No. 456 of 1884.

(PLOWDEN & BARKLEY, JJ.).

Owner's rate—Northern India Canal and Drainage Act (VIII of 1873), *Sections* 37, 40, 41, *and* 42.—The question in this case was whether a proprietor who has paid owner's rate, as defined in Section 37 of the Northern India Canal and Drainage Act, for Canal irrigated lands held by his tenants having occupancy rights in the land for which the rent was paid, could recover the sum so paid from the tenant, on the ground that the tenant was liable to pay the owner's rate under Section 40 of the Act, notwithstanding the fact that the land was irrigated from the Canal when the rent payable by the tenant was fixed. *Held*, that, while Section 40 of the Act provides that in certain cases the tenants shall pay the "owner's rate," the object of Section 42 clearly is to provide—1st, that in other cases the tenant shall not be liable to pay, and 2nd, that the tenant shall also not be liable to pay "if, when the amount of rent was fixed, the land was irrigated from the canal," therefore the owner in the present case could not recover the rate from his tenant.

Second appeal from the order of R. Maconachie, Esquire, Judicial Assistant Commissioner, Delhi, dated 29th November 1883.

Spitta, for appellant.

Cope, for respondent.

The fact of the case sufficiently appear from the following judgment of the Court delivered by—

BARKLEY, J.—This case and three others heard with it (Nos. 457, 458 and 459 of 1884), in all of which the appellant is the same, all raise the question whether a proprietor who has paid owner's rate, as defined in Section 37 to the Northern India Canal and Drainage Act, 1873, (Act VIII. of 1873), for

Canal irrigated lands held by his tenants having occupancy rights in the land for which the rent was paid, can recover the sum so paid from the tenant on the ground that the tenant was liable to pay the owner's rate under Section 40 of the Act, notwithstanding the fact which is admitted, that the land was irrigated from the Canal when the rent payable by the tenant was fixed. Both the Courts below have held that he cannot, as Section 42 of the Act declares that if, when the amount of rent was fixed, the land was irrigated from the Canal, the owner shall pay owner's rate. It is not alleged that the owner's rate was imposed by Government upon the tenant under the provisions of Section 40 of the Act, or that the plaintiff has been required, under Section 47, to collect and pay it as a sum payable by the tenant, and the case must therefore be taken to be one in which the owner has been compelled to pay a sum which he alleges to be payable by the tenant under the provisions of Section 40.

That section provides for two cases in which the occupier is required to pay the owner's rate as well as the occupier's rate; one of these is where the owner is himself the occupier, and this presents no difficulty. The other is where the land is occupied by a tenant whose rent is not liable to enhancement on the ground that the value of the produce or the productive powers of the land has, or have been, increased by irrigation. The cases now before us fall within the latter class, as the rents of occupancy tenants can only be enhanced under the provisions of Section 11 of the Punjab Tenancy Act, and the ground stated is not one of the grounds of enhancement under that section. The tenants in these cases also pay a fixed cash rent, and not a rent varying with the produce of their lands. These cases are therefore covered by the language of Section 40; and the only question therefore is whether it can be gathered from the other provisions of the Act that the Legislature did not intend that section to apply to them.

The following Section (41) enables Government, in the case of a tenant with a right of occupancy, to make rules for dividing the owner's rate between the tenant and his landlord proportionately to the extent of the beneficial interest of each in the land. It is found by the lower Appellate Court that no rules have been made, under this section; but it seems clear that unless it is held that the previous section does not apply to tenants with occupancy rights, any rules which might be made under this section would qualify the provisions of Section 40, so far as they relate to such tenants. There appears to be nothing to lead to the conclusion that the general word "tenant" in Section 40 was used in a restricted sense, so as to exclude tenants with rights of occupancy. The most usual instance of a tenant whose rent was not liable to enhancement would be that of tenants with rights of occupancy, and if it had been intended that Section 40 should not apply to these, it may be presumed that it would have been thought necessary to exclude them by express words. Section 41 has not been made a proviso to Section 40, probably because it might apply to some cases other than those to which Section 40 applies; but the power to make rules for the distribution of the owner's rates which it gives may apparently enable the Local Government to qualify the more general rule contained in the proceding section.

Section 42 again specifies two cases in which the owner shall pay the owner's rate. The first of these is when the land is occupied by a tenant whose rent is liable to enhancement on the ground already mentioned in stating the provisions of Section 40. This obviously includes all tenants other than those mentioned in Section 40, as, though in Section 42 the word used is "occupier" not "tenant," this makes no difference, occupier being a more general word, and an occupier who pays rent being necessarily a tenant. The second case is where, "when the amount of rent was fixed, the land was irrigated from the Canal." This must also apply to a case where the land is held by a tenant, and, in order that it may receive any meaning, not included in the other case specified in the section, it must apply to land held by tenants specified in Section 40. Though not expressed as an exception, it therefore operates as an exception to Section 40. It provides for a particular case, which would otherwise be included in the general rule laid down by Section 40, and thereby takes that

case out of the general rule. This is the only way in which effect can be given to the intention of the Legislature, for we should not be justified in coming to the conclusion that the Legislature did not see that all tenants liable to rent must belong either to the class specified in Section 40, or to the first class specified in Section 42, or that it did not intend the 2nd class specified in the latter section to be a class not included in the 1st class specified in the same section.

Section 37 also indicates that the owner's rate was ordinarily intended to be imposed on the owners of Canal irrigated lands. Section 40 provides that in certain cases the tenant shall pay: and the object of Section 42 clearly is to provide, 1st, that in other cases the tenant shall not be liable to pay, and 2nd, that the tenant shall also not be liable to pay "if, when the amount of rent "was fixed, the land was irrigated from the Canal."

It is clear that, on the facts admitted in the cases now before us, they fall within the exception to Section 40, established by the latter portion of Section 42, and the landlord's appeal must therefore be dismissed with costs.

It may be, as urged before us, that the case is one of considerable hardship to the landlord, as with reference to the rule laid down in Punjab Government Notification No. 576½, dated 25th June 1880, he may be assessed at owner's rate on the irrigation of his tenants, which may more than swallow up the surplus of the rent remaining to him after paying the land revenue and cesses, and the more valuable the crops are which the tenants irrigate, the higher may be the owner's rate he may be called upon to pay, though the rents receivable by him do not increase in consequence. If this is so, all that can be said is that the principles on which the owner's rate are assessed, are such that it cannot be regarded as an assessment in respect of the benefit which the owner derives from the Canal irrigation, though such an assessment is what is contemplated by Section 37, and the owner must seek his remedy from Government, which presumably would grant him relief if his case were properly represented to it.

PLOWDEN, J.—I concur in the foregoing judgment. The interpretation proposed appears to be the only way to reconcile the seemingly contradictory provisions of Section 40 and Section 42. There is so much obscurity about the true meaning of these three Sections (40 to 42), that it is to be hoped that they will be reconsidered and made more clear when next the Canal Act comes under revision, especially if the result of their operation, as now interpreted, is to cause actual loss to the proprietors of lands irrigated by a hereditary tenant. *(Punjab Record, Civil Judgment No.* 88 *of* 1885).

D.

Enquiries and correspondence as to the actual Division of Owner's rates between landlords and tenants.

No. 341, dated Lahore, 16th January 1886.

From.—The Secretary to Financial Commissioner, Punjab,

To—The Commissioner and Superintendant, Delhi Division.

I AM directed by the Financial Commissioner to call your attention to the Chief Court's Civil Decision No. 88, published in the *Punjab Record* for October 1885, and to ask you to call on the Deputy Commissioners of Gurgaon, Delhi, Rohtak, Hissar and Karnal, and on Settlement Officer Karnal, for a report on the question whether the effect of this decision will be that owners will be required to pay by the combined charge of Land Revenue and owner's rates larger sums than they actually recover as rent from occupancy tenants.

2. If this will be the result of that decision, I am to ask for suggestions as to the framing of rules under Section 41 of Act VIII. of 1873.

No. 354, dated Delhi, 4th June, 1886.

From.—Lieut.-Colonel L. J. H. GREY, C. S. I., Commissioner and Superintendent, Delhi Division.

To.—The Senior Secretary to Financial Commissioner, Punjab.

The replies of Deputy Commissioners to your No. 341 of 16th January 1886 have been received as follows :—

Hissar	6th February.
Rohtak	25th do.
Gurgaon	22nd March.
Karnal	5th March.
Delhi	12th May.

Settlement Officer, Karnal, can offer no opinion.

I forward these herewith, remarking that your para. 2 has been complied with only by Rohtak and Gurgaon.

2. Mr. Maconachie's suggestions were furnished as early as 21st December 1882, and I prefer them to the later ones of Mr. Purser; but as said in my own letter to Deputy Commissioner, Hissar, I have not yet understood the reason why the difficulty should arise and why the owner's rate should not be an increment to the occupier's rate, both being regarded as the price of water payable by whoever uses it.

No. 55, dated Karnal, 3rd March 1886.

From—Colonel J. M. BIRCH, Deputy Commissioner, Karnal District.

To—The Commissioner and Superintendent, Delhi Division.

Land Revenue and Owner's rate.

With reference to his Circular No. 30, dated 25th January last, begs to state that owners will not be required to pay, by the combined charge of land revenue and owner's rates, larger sums than they actually recover as rent.

2. If the owner is paid by the batai system in kind, though he has to pay the owner's rate, he is recouped by his larger share of the produce. If there is fixed rent the owner has to pay the owner's rate; but there would not be fixed a sum which left him a loser, or he would immediately give up his proprietary dues, rather than pay more than he received. The fact is that in this District there are very few payments to proprietors as such. Owners themselves occupy, or in other instances the custom of the country is for the occupiers to pay all dues, including the owner's rate, leaving nothing for the proprietor; the owner's rate payment being taken as equivalent to any claim the proprietor may have.

No. 137, dated Delhi, the 11th May 1886.

From—GEORGE SMYTH, Esquire, Deputy Commissioner, Delhi District,

To—The Commissioner and Superintendent, Delhi Division.

I have the honor to reply to your Circular No. 30, dated 25th January last, enquiring if the effect of the Chief Court Judgment No. 88, published in the *Punjab Record* of October 1885, will be that owners will be required to pay, by the combined charge of land revenue and owner's rate, larger sums than they actually recover as rent from occupancy tenants; and secondly, if such be the case, asking for suggestions as to the framing of rules under Section 41, Act VIII of 1873.

2. The history of the subject in this District in regard to the villages irrigated from the Western Jamna Canal briefly is, that previous to last settlement the majority of occupancy tenants paid to the owners nothing more than the revenue and cesses assessed on the land, such revenue and cesses being assessed at irrigated rates. At the last settlement dry or barani rates were substituted for irrigated rates, and the imposition of owner's rate arranged as the charge representing the benefit the land derived from facilities for irrigation.

3. When the new settlement came into force the change was very imperfectly understood by the zemindars, the reduced or dry rates were hailed with joy, and as the abiana rate and owner's rate were heavy charges the zemindars,

both owners and tenants, abstained to a considerable extent from taking water for the first year or two. The owners claimed from the tenants payment of rent at the old or irrigated rates, and the claim was generally acquiesced in, so that while the tenants abstained from taking water, the owners reaped the benefit of the difference between the old and new rates.

4. In this District the new settlement came into force in the Delhi and Sonipat Tahsils at the rubbi harvest of 1830, but presently the question of the framing of rules for regulating the apportionment of owner's rate between owners and tenants having arisen in the Karnal district, and in accordance with the views expressed by the Financial Commissioner in letter No. 1041, dated 17th February 1882, from his Senior Secretary to your address, an enquiry was made, and a Register prepared recording and settling for each village in detail the fact as to whether the owner's rate on lands held by occupancy tenants was to be paid by the owner or tenant.

5. The principles on which this register was prepared are briefly as follows:—

Where the rent was taken in kind the owner paid; where the tenant paid at the old settlement rate, and the old rate was more than double, double, or nearly double the new, the owner paid. Where the difference between the old and new rates was small, or other special circumstances existed, the tenant paid, aad where the tenant paid rent equal to the revenue and cesses at the new rates the tenant paid. The entries in this register were assented to both by owners and tenants and have been the basis on which the assessment has been levied ever since.

6. The preparation of this Register gives the following results in the Delhi Tahsil:—

At the Settlement 102 villages were entered as Chak Nahri. At the revision, at the time of the preparation of the Register, it was found that 12 villages had ceased to receive water. In 18 there were no occupancy tenants. In 7½ villages rents were taken at the old rates and the old rates being about double the new, the owner's rate is paid by the owners. In 8 villages rents are taken in kind, and owner's rate paid by the owners. In 23 villages the tenants were recorded as paying at the new rates, and they pay owner's rate. In 16 villages the tenants were recorded as paying at the old rates, but have actually always paid at the new rates. They now pay at the new rates, and pay owner's rate. In 11½ villages the tenants paid at the old rates, but with the consent of the owners these were altered to the new rates, and the tenants pay owner's rate, and in the remaining 6 villages, the tenants continue to pay at the old rates, but the difference between the old and new rates being trifling, the tenants pay owner's rate.

7. In this list therefore the only villages affected by the decision of the Chief Court are the 7½ villages in which the owners pay owner's rate, and the 6 in which the tenants pay, as the tenants in all these cases pay rent at the old or irrigated rates, and under the 2nd clause of Section 42 of Act VIII of 1873, the owners are liable to the payment of owner's rate.

8. The following statement gives the detail of the 7½ villages in which the owners pay, and of the old or irrigated rates, and the new or barani rates:—

No.	Name of village.	Old or irrigated rates at which rents are taken per bigah.			New or barani rates per bigah.		
		Rs.	A.	P.	Rs.	A.	P.
1	Azadpur	2	14	6	1	4	0
2	Badli...	2	15	3	1	7	3
		This includes cesses			This does not include cesses.		
3	Shakurpur	2	5	1	1	5	1
4	Salapur Magra	3	4	8	1	0	9
5	Haidarpur	2	4	0	1	1	3
6	Alipur...	2	1	0	0	14	10½
7	Nahrpur	2	1	0	0	14	8½
8	½ Rithala	1	13	2	0	13	8

Of these Alipur is the village of the parties to the suit in Chief Court's Judgment No. 887 above mentioned.

9. The following statement gives the detail of the 6 villages in which the tenants pay rent at the old or irrigared rates and also pay owner's rate:—

No.	Name of village.	Old or irrigated rates per bigah.			New or barani rates.		
		Rs.	A.	P.	Rs.	A.	P.
1	Gheora	1	5	3	1	1	11
2	Nizampur	1	9	3	1	5	3
3	Gorhi Rendhala	1	7	2	1	5	2
4	Nangloi Jat	0	13	6	0	11	10
5	Kanjhaula	0	15	5	0	11	4
6	Koraini	1	9	0	1	0	9

The charges for owner's rate are Re. 1-9-0 per beegah for sugarcane, Rs. 0-15-0 for rice, tobacco and vegetables, Rs. 0-11-3½ for wheat, gram and other rabbi crops, and Re. 0-8-4 for jowar and other similar kharif crops.

10. In the 7½ villages above mentioned the margin of profit between the old and the new rates in only one case is less than Re. 1-0-0, and is usually about Re. 1-3-0, or upwards. In lands from which one crop only is taken the owners in such villages will only suffer loss when sugarcane is extensively cultivated by their occupancy tenants. As a matter of fact however, occupancy tenants seldom have the capital or means for cultivating more than two or three bigahs of sugarcane, and where they share in the cultivation of a larger area they do so with the owners themselves. In the case of double cropped land such as, for instance, when wheat and tobacco, tobacco and jowar, or wheat and jowar are raised the owner's rate payable amounts to Re. 1-10-3, Re.1-7-4 or Re. 1-3-7 per annum respectively, but the area of double cropped land is never very large, so that taking into consideration the area under sugarcane, the area double cropped, and the area under other single crops except sugarcane, the owners in these villages will usually have a slight profit, though occasionally they may suffer loss. Under the old settlement the owners had no profit, and they suffered no loss, and if under the arrangement at present in force they find their losses preponderate, I have no doubt that the tenants will gladly consent to pay rent equal to the present land revenue and cesses and also pay owner's rate, and even if the tenants refuse I believe the owners could legally enforce their claim to return to the old system.

11. But the case of the other 6 villages is different. In none of them is the margin of profit more than Re. 0-8-3, and it is usually about Re. 0-4-0 so that under the decision of the Chief Court rendering owners liable for owner's rate, the owners must undoubtedly suffer loss. At present the tenants pay owner's rate, but as the owners are liable the only course open to the latter is to endeavour to arrange with their tenants, to pay all charges as they did at the previous settlement, and for the owners to forego all profits.

12. In the Sonipat Tahsil there are 118 villages in the Nahri Chak; of these there are 49 in which there are no tenants and 65 in which the tenants pay at the new settlement rates and pay owner's rate, leaving only 4 villages remaining. Of these four villages there are two in which the tenants pay rent at the old settlement rates and the owners pay owner's rate, and there are two in which most of the tenants pay at the new settlement rates, and pay owner's rate, and a few pay at the old settlement rates, the owners paying owner's rate.

No. 40, dated 3rd February 1886.

From—Lieut.-Colonel H. Grey, c. s. i., Deputy Commissioner of Hissar District,
To—The Commissioner and Superintendent, Delhi Division.

In reply to your Circular No. 30 of 25th January 1886, my opinion is that Chief Court Judgment No. 88 of October 1885, may certainly result in owners paying more than they receive from occupancy tenants.

I am at a loss to suggest a remedy under Section 41 of the Canal Act. Were there but one payment for water advantage instead of two, the matter would settle itself: whoever took the water would pay for it, and the owner would get his dry rent. I have never understood the object of a double payment for water. Of course I know how the owner's rate arose, *viz.*, as a means of showing full credit to the Canal Department for its working. But this would be equally achieved, with the saving of much bewilderment to all concerned, by having as land revenue only a dry rate, and as Canal Revenue one acreage rate by crops, instead of two, of which one, the owner's rate, is a fraction of the average of the other, the water rate.

No. 94, dated the 22nd March 1886.

From—W. E. Purser, Esquire, Deputy Commissioner of Rohtak,
To—The Commissioner and Superintendent, Delhi Division.

I have the honor to reply to your Circular No. 30, dated 25th January 1886, concerning payment of owner's rate by occupancy tenants.

2. The replies of the Tahsildars, as to whether under the Chief Court ruling the owners may have to pay more than they get from their tenants, are vague. But as the occupiers of the land almost invariably pay this rate, it is almost certain that if it is transferred to the owners the latter will be called on to pay more than they receive.

3. The wording of Section 41 of Act VIII. of 1873, seems to me to make it difficult to frame any rules to avoid this unfairness. If Government frames rules under this section, it must put some of the owner's rate on the owner if he has any beneficial interest in the land, though he may not have paid any portion of it previously. I cannot myself see any way of framing a general rule which will meet all cases, so as to divide the owner's rate between the tenants and landlord "proportionately to the extent of the beneficial interest of each in the land." The only rule I can suggest is that "in no case shall the landlord be liable on account of revenue and owner's rate for a larger sum than he receives or might receive from the tenant. If the combined charge exceeds the amount received the tenant shall pay the whole or so much of the owner's rate as will make up the difference." This will prevent the landlord having to pay more than he gets, but will not protect him from loss. For instance if the revenue was Re. 1 and the rent Re. 1-4-0, the landlord had a profit of Re. 0-4-0. If the owners rate is Rs. 2 he will under the Chief Court ruling have to pay Rs. 3. By the proposed rule the tenant will have to pay Re. 1-12-0 of the owner's rate, leaving Re. 0-4-0 for the landlord to pay. This, added to Re. 1 revenue, swallows up all his rent, so that he loses the Re. 0-4-0 beneficial interest he had before.

4. I think it will be necessary to get Act VIII of 1873 amended, so as to give the Government power to direct who is to pay the owner's rate, and if both owner and tenant, then in what proportion, unfettered by any clause about proportionate beneficial interest. In this case the following rules may be suggested:—

A.—When rent is paid in kind the owner's rate shall be paid by the owner or tenant, according as the owners or tenant paid it when the present shares on which the produce is divided were fixed.

B.—If rent is paid in cash—

(1) and the tenant has hitherto paid the owner's rate, he shall continue to do so;

(2) if the tenant has not hitherto paid the owner's rate and the land was not irrigated when the present rate of rent was fixed, the tenant shall pay the owner's rate;

(3) if the tenant has not hitherto paid the owner's rate and the land was irrigated when the present rent was fixed, the share of the owner's rate to be paid by the tenant, shall bear the same proportion to the total owner's rate as the fixed revenue of the land does to the rent.

Provided that in no case shall the landlord be liable on account of fixed revenue and owner's rate for a larger sum than he receives or might receive from the tenant. If the combined charge exceeds the amount received, the tenant shall pay so much of the owner's rate as will make up the difference.

Owner's rate shall be considered revenue within the meaning of Act XXVIII.

5. Cases can be imagined in which even these rules would not be very satisfactory; but in the great majority of instances they would prove fair.

E.

Discussion as to the system to be introduced on the Sirhind Canal which resulted in a decision to introduce a single occupier's and no owner's rate.

No. 388 S., dated Lahore, 17th April 1882.

From—F. C. Channing, Esquire, Settlement Secretary to Financial Commissioner, Punjab.
To—The Secretary to Government, Punjab.

I am directed to forward a printed copy of a letter from the Joint-Secretary to Government, Irrigation Department No. 1584 I, of 8th April, on the subject of the water rates to be levied on the Sirhind Canal, and to submit the following remarks by the Financial Commissioner.

2. Mr. Lyall thinks that the officers of the Canal Department must be the best judges as regards the best practicable method of distribution of the water of the new Canal, and it therefore hardly seems useful for him to express an opinion on this subject; but he desires to state that the system devised by Colonel Home strikes him as practicable, and also, as Colonel Home remarks, as a step in advance. If, as the Chief Engineer surmises, it may possibly pave the way to the introduction of contracts, that is, in Mr. Lyall's opinion, another great recommendation in its favor. The Financial Commissioner also agrees in the view expressed by Colonel Home in paragraph 20 of his memorandum, as to the arrangements to be made in the case of distributaries passing through the lands of Native States. The only point in the proposal as to distribution which strikes Mr. Lyall as doubtful is the proposal to make the grant or allotment of Canal water subject to prohibition of the use of Canal water on well lands, and thereafter to punish Canal irrigation of such land under the Canal Act Rules relating to unauthorised irrigation. Mr. Lyall agrees that in the calculations made for fixing the amount of water to be allotted to a village, the well lands should be deducted from the irrigable area, but whether it will be practicable and expedient to go further and actually prohibit Canal water being used on well lands is, he thinks, doubtful. Perhaps, however, it will be best to allow the experiment to be tried: the prohibition could be withdrawn at any time.

3. Turning to the question of the rates to be charged, I am to point out that Mr. Lyall very fully expressed his views as to the general policy to be adopted in the case of new Canals in a note written with reference to a letter from the Secretary to Government of India, Revenue, Agriculture and Commerce Department, No. 110 of 28th February 1879. This note was submitted to you under cover of my letter No. 71 S. C. of 21st July 1879, and will be found printed in Proceedings of December 1879, No. 9. He still holds to the views there expressed, and agrees with General Gulliver and Colonel Home in thinking it desirable to take a single rate (not two rates or a rate divided into occupier's and owner's rate), and that this rate should be pitched as high as the necessity of not too long retarding the spread of irrigation, and of not excluding all but first class soils and crops from irrigation, will allow. The choice of rates seems to lie (1) between those proposed by Colonel Brownlow in paragraph 7 of his note, (2) the Agra

Canal occupier's rates, and (3) the rates recommended by Colonel Home. Colonel Brownlow states with great force the reasons in favour of moderate water rates, and no doubt the rates suggested by Colonel Home seem questionably high on the rabi crops and poorer kharif crops; but nevertheless the Financial Commissioner is in favour of a trial being given to them : if some of the rates are found in practice to be objectionably high it will be easy to lower them.

4. If, from the commencement of irrigation, a high water or occupier's rate is levied, it will probably not be necessary for a good many years to decide in what form the owner's rate is to be assessed ; but the Financial Commissioner thinks that it should eventually be assessed in the manner described in paragraph 2 of his note above referred to, and not as an additional water rate. This is also, Mr. Lyall perceives, the opinion of Colonel Brownlow, who gives very strong reasons for not attempting to realize the full value of the water by one direct charge of water rate, but he seems to anticipate more speedy and frequent assessments of owners' rate than Mr. Lyall expects to be required with the highly-pitched occupiers' rates now proposed ; although, no doubt, with lower occupiers' rates such assessments as Colonel Brownlow anticipates might be necessary.

5. The Financial Commissioner thinks it would be well to so fix the water rates per acre as to give convenient rates on the local kanal or biswa, as thus the zamindars will be enabled to understand the measurements and assessments. Major Wace has shown great interest in this subject, and Mr. Lyall recommends his being consulted on it.

6. Mr. Lyall is sending a copy of this correspondence to Major Wace for communication to the Settlement Officers of Ludhiana and Sirsa, and is inviting them to express their opinions on any point on which they wish to offer them. On the receipt of Major Wace's reply, it will be submitted to you.

No. 15841., dated Lahore, 8th April 1882.

From—Lieutenant-Colonel R. Home, R. E., Offg. Joint Secy. to Government, Punjab, P. W. Dept., Irrgn. Branch,
To—The Secretary to Financial Commissioner, Punjab.

I am desired to forward herewith printed copies of correspondence on the subject of the water rates which are to be levied on the Sirhind Canal.

2. With the correspondence are notes and proposals by General Gulliver, Joint-Secretary, and Lieutenant-Colonel Home, Officiating Joint Secretary in this Branch.

3. I am to request that you will forward the correspondence with your remarks and suggestions for the orders of His Honor the Lieutenant-Governor previous to the submission of the case for the final orders of the Government of India.

4. I am to say that the first 18 paragraphs of Lieutenant-Colonel Home's note were separately submitted for His Honor the Lieutenant-Governer's perusal, and Sir Robert Egerton recorded the following note, dated 10th March 1882, on the proposals therein contained :—

"I think the proposal to make the openings for irrigation in minor distributaries instead of as at present in the rajbahas is one which will effect a great economy in the consumption of water, and will give the Canal officers the most effectual control over the water.

"There may be some difficulty at first in determining the proper size of the minor, so as to provide for the amount of irrigation which will ultimately be taken from it ; but I think that it is much better to run the risk of having to alter the minor than to contruct village water-courses, leading direct from the rajbahas.

"The great facility for quick irrigation which the proposed plan will give is one of the greatest recommendations of it.

"I quite approve of the plan."

Note by Major-General H. W. Gulliver, R. E., Chief Engineer, Irrigation Works, Punjab, on the Water Rates to be levied on the Sirhind Canal,—dated 13th January 1882.

Before leaving for England I think it is advisable to place on record my opinion on the subject of the rates to be levied for irrigation on this Canal.

I have obtained reports from the Bari Doab Canal, Western Jumna Canal, and the Chief Engineer, North-Western Provinces and Oudh, on the subject. The Financial Commissioner has also forwarded a memorandum from the Settlement Commissioner.

These data should now, I think, be forwarded to the Financial Commissioner for his opinion, previous to the case being laid before His Honor.

The subject is naturally divided into two heads—

The method of distributing the water.

The rates to be charged.

The method of distributing the water.—On the Western Jamna Canal it has been the custom to grant such water-course heads as appear necessary to the village community as a whole, leaving them to distribute the water among themselves by mutual agreement ; and no difficulty has been met with in doing this.

On the Bari Doab Canal when it was first opened, the system was to grant water-course heads to applicants, provided that no two villages irrigated from the same water-course.

The people who got the grant made the water-courses, and allowed the villagers to irrigate from them. In many cases they levied payment from the irrigators for the use of the water-course ; and in some cases had no lands themselves, but simply constructed the water-course as a speculation.

When water became valuable, those owners who had lands tried to get rid of the cultivators whom they had allowed to use the water-course in the first instance, so as to keep all the water for their own lands. This led to petitions to have the use of the water-course continued to them being presented to the Canal Officers from those who had been ousted, and where they could prove that they had contributed to the first cost of the water-course, or had been allowed the use of it for some years, they were admitted as shareholders under the rules made in accordance with the provisions of the Canal Act.

But the effect of this is, that on the portions of the Canal where water was issued in this manner there is no proper record of rights in the water-courses. An attempt was made a short time age to check unauthorised use of the water, as in many villages the proportion of area irrigated to the whole area of the village was excessive.

This led to so many claims being made under the Act for admission as shareholders in the water-courses (I have heard 800 mentioned as the number in one division, and many more were expected) that it became evident that a regular record of rights would have to be prepared, and this will be a long business, and, I fear, expensive.

Afterwards when it had become evident that to distribute the water rateably along the whole line of the canal, and to enable those near the end to get a fair supply of water, it would be necesssary to limit the grant for each village to what would suffice for a certain proportion of its area, a different sys'em was introduced on the new distributaries of the Bari Doab Canal.

It was first decided what proportion of the whole village area was to be watered. The officer then took the list and map of the village estates, and assigned a fair proportion of the water which he allotted to the village to each estate. This entailed a very great amount of labour on the Canal Officer ; but, at any rate, a complete record of the rights to water was made.

The Settlement Commissioner asks that in introducing irrigation on the Sirhind Canal the system may be made to harmonize with—

The manner in which the lands have been divided by the village owners ;

And with the pre-existing system of dry cultivation.

He points out that the great majority of the villages are cultivated by the

The recent orders are that all lands should be assessed at unirrigated rates and that owners' rate should be charged only on lands which are actually irrigated.

This has been carried out to some extent, but I believe not entirely; for I have been warned that if the irrigation of certain tracts is even reduced, the people will be unable to pay the ordinary assessment.

The owner's rate is now assessed only on irrigated lands, and is consequently thus evidently a Canal asset due to the Canal operations; and it has been so declared by the Government of India. The Civil Officers, however, having been used to consider the old enhanced land revenue as land revenue proper, and to charge the cesses for roads, schools, &c., on it still adhere to the idea that the owners' rate is land revenue, and that the amount of their cesses will be reduced if it is treated entirely as Canal revenue.

This is the only argument I am aware of for retaining it as a separate rate. I cannot agree to the correctness of it, and object to the extra work caused by its assessment as a separate rate. Moreover, I think that in dealing with the lands of Native States irrigated from British branches, there will practically be difficulty in making the division understood.

On the Western Jumna Canal we have had to forego owner's rate on the lands irrigated in the Jind territory, because it has not been entirely treated as a water-rate, and we thus lose one-third the value of the water expended in that State.

If the owner's rate were a varying rate, assessed according to the benefits derived by land, on different portions of the Canal from irrigation, and in proportion to the dryness of the locality, thus supplying a fluctuating element in the rates charged on different portions of the Canal, I would say no word against it. But as it is a fixed proportion of the occupier's rate, one-third on the Agra and one-half on the Western Jumna Canal, I can see no reason for its maintenance, and many reasons for the imposition of a single rate.

As to the occupier's rate to be levied, this was most carefully considered on the revision of the Bari Doab Canal rates, and the amounts fixed were as shown in the enclosed table.

I at the time proposed Rs. 3 per acre for the crops in Class III, and am still of opinion that it might have been levied.

The officers of the Bari Doab Canal agree that this crop would pay a higher rate.

Colonel Brownlow says that if the rain-fall is scant, and the land good, and the cultivators careful and industrious, he would be inclined to put on the Agra Canal rates from the commencement, in which wheat is assessed at Rs. 3 per acre.

All the officers urge that rice be included in Class I, paying the highest rate on account of the large quantity of water that is used for it, and because on a very large proportion of the lands on which it is grown a second crop is afterwards raised for which nothing is charged unless it is again watered in the subsequent season.

It has also been proposed that if a crop is grown on land for which a single watering has been taken for ploughing, double the rate that is charged on land which lies fallow should be levied.

The area of Indian corn has increased greatly on the Bari Doab Canal; this is a valuable crop, and requires much more water than the crops of millets with which it is now classed.

It is proposed to place this in Class III, and charge Rs. 3 per acre, instead of Re. 1-8-0 as at present.

I have always advocated the imposition from the very commencement of irrigation of rates which will not require to be increased for a long period. If they are found after a fair trial to impede the proper spread of irrigation, they can be reduced; but any change in the direction of an increase upsets the whole community: indeed, any change causes disturbance.

On the Western Jumna Canal the mere alteration from an extra land assessment to an owner's rate on the irrigated lands has brought down the area irrigated to the lowest point recorded.

On the Bori Doab Canal the alteration from a uniform rate to one on classified crops caused much disturbance.

I therefore propose that the Agra Canal rates be adopted for the Sirhind Canal, and that, as on that Canal, land newly irrigated shall only be charged with half rates for the first two years.

Rates on lands watered by lift should behalf those on lands watered by flow.

If it be decided to levy a separate owners' rate, it ought, in my opinion, to be carefully fixed according to the amount of rain-fall, depth to water in the wells, and the nature of the soil; thus forming in the rates charged in different portions of the Canal a fluctuating element which it is not advisable to introduce into the occupiers' rates.

But this would, I fear, be too expensive a proceeding anywhere except where a settlement is in progress, and so we should have for the present to be satisfied with the system of making the owner's rate a proportion of the occupiers' rates.

This indeed meets the case of different descriptions of soil, as the best crops will be grown on the best land, but not that of the different nature of the seasons in the several parts of the district traversed by the Canal.

A table is attached showing the rates on the most important Canals and those I propose to levy on the Sirhind Canal—

Crops.	Ganges and Eastern Jumna Canal.	Western Jumna Canal.	Bari Doab Canal.	Branches of Ganges, Lower Ganges, Agra.	Proposed for Sishind Canal. Occupiers'.	Proposed for Sishind Canal. Owners'.	Proposed for Sishind Canal. Total.
	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
Sugarcane ...	5 0 0	5 0 0	6 0 0	6 10 8	6 0 0	2 0 0	8 0 0
Rice ...	5 0 0	3 0 0	4 12 0	6 10 8	6 0 0	2 0 0	8 0 0
Gardens ...	3 0 0	5 per acre	4 12 0	4 0 0	4 0 0	1 5 4	5 5 4
Tobacco ...	...	3 0 0	2 8 0	...	3 0 0	1 0 0	4 0 0
Opium ...	...	...	...	...	...	...	...
Vegetables ...	...	...	...	...	...	...	...
Orchards ...	...	...	...	...	...	...	...
Water-nuts ...	...	...	...	...	...	...	...
All rabi crops ...	2 4 0	2 4 0	2 8 0	3 0 0	3 0 0	1 0 0	4 0 0
Indigo ...	...	...	...	...	...	...	...
Cotton ...	...	...	...	...	...	...	...
Indian corn (maize) ...	...	...	...	...	...	...	...
All kharif crops not specified above ...	1 10 8	1 10 8	1 8 0	2 0 0	2 0 0	0 10 8	2 10 8
Single watering before ploughing for fallow lands ...	...	1 0 0	0 12 0	...	0 12 0	0 4 0	1 0 0
Ditto if afterwards sown, but not again watered ...	...	...	...	...	1 8 0	0 8 0	2 0 0
Irrigation by lift ...	⅔ the above	⅔ the above	½ the above	½ the above	½ the above	½ the above	...

The above rates are per acre per crop, with the exception of the gardens of the Western Jumna Canal, which is Rs. 5 per annum.

If one rate only be levied it should be the total of occupier's and owner's rate.

Note by Lieutenant-Colonel R. Home, R. E., on the Distribution of Water and Rates to be levied on the Sirhind Canal,—dated 30th March 1882.

General Gulliver, in his note on the water-rates to be levied on the Sirhind Canal, dated 13th January 1882, divides the question into two heads—

The method of distributing the water.

The rates to be charged.

2. In discussing the first question he mentions that on the Western Jumna Canal it has been the custom to allot a certain supply to the village as a whole, and that the villagers have always been found capable of arranging the further distribution to individual estates in a satisfactory manner.

3. This statement appeared to me to be a possible basis for a simpler system of distribution than that which has been for some years past in use on the Bari Doab Canal, and which General Gulliver proposed to introduce on the Sirhind

Canal. I took an opportunity whilst on tour on the Western Jumna Canal of meeting Diwan Singh, one of the oldest and best Deputy Collectors in the Department, to learn from him the manner in which irrigation was carried out on the Butana branch of that Canal.

4. The explanation which Diwan Singh gave was briefly as follows :—

The Canal is worked entirely by stop-dams. The water is held up at each dam for a certain number of *pahars* of three hours each in proportion to the irrigable area in the villages whose water-course heads are placed above that dam. The whole irrigation on the Canal is divided into about 200 *pahars*, which makes the turn or *wár* to be 25 days. The size of the water-course heads is roughly proportioned to the area to be watered. The total *wár* is inviolable.

If at any dam the whole number of *pahars* allowed is not required, the water is passed on the next dam so much the sooner, and so on. The spare time accumulated in this way at the end of the *wár* is employed in giving an extra supply to those *hissadars* who may require it ; to the lands at the tail of the Canal which are sandy and are always ready for a *bewar* watering ; and lastly, to lands the owners of which are not *hissadars* in any water-course.

5. The distribution of the water after it leaves the Canal is arranged by the villagers who are *hissadars* of the various water-courses in virtue of money or labour given towards the excavation of the water-course. The number of *pahars* in the *wár* for a water-course is divided among the *hissadars*: when water is scarce, the share of an individual irrigator is sometimes measured by the five minutes. Each man knows his time and turn, and a list of them is kept, which when disputes occur, is appealed to, and upheld by the Canal establishment.

6. Further, at the commencement of every fasl, the zilladar and chuakidars find out from each village and from the irrigators of each water-course the areas which they propose to water during that fasl, and, in accordance with the information thus obtained, more or less water is held up at the stop-dams, the regulation of which is effected either by allowing a larger or smaller supply to enter at the Canal head, or by removing a plank from the dam and allowing the surplus water to flow on to the thirsty villages at the tail of the Canal.

The Deputy Collector did not anticipate any difficulty in introducing a similar system of internal distribution in the case of new irrigation if the work were undertaken by competent men, but he could not help me to devise any scheme of *wárs* for a channel on which stop-dams were not employed.

7. It appears to me, however, that a practically identical system can be carried out on a running channel if, instead of placing the water-course heads in the bank of the distributary, the whole of the irrigation is carried on from 'minors.'

These 'minors' would be taken out from the main or branch channel of a distributary at convenient points selected generally with reference to levels, but also with regard to the position of the lands to be irrigated. They would run out into the irrigated country, and the water-course heads would all be located in their banks. The total length of a 'minor' should be limited to (say) two miles. They would be constructed and maintained by Government in the same manner and with the same care as the distributaries.

8. Irrigation from a distributary would then be carried out by a system of *wárs* like that described for the Butana Canal, except that instead of stopping the entire body of water at certain specified places, a number of 'minors' whose discharge taken together would be equivalent to the total capacity of the distributary, would be opened at the same time; when their *wár* of so many days was over, another set of 'minors' would be opened, and so on until the whole had in turn received a watering. A certain number of days would then be reserved as a *sirkari wár*, and then water would again be turned into the first set of 'minors,' which would receive a second watering, and so on during the whole of the irrigating season.

The *sirkari wár* would be used either to close the whole distributary for clearance or repairs, or in times of drought to give water to men who are not *hissadars* in the village water-courses, or generally to meet an exceptional demand.

9. The tail of a distributary, if the surplus water cannot be returned to the Canal or given into another distributary, would consist of two or more 'minors' and in fixing the *wárs* it should be arranged that one of these tail 'minors' should always be running during the whole time that water entered the head of the distributary. This would be the most desirable arrangement ; but in the case of long distributaries ending in natural drainages or in the open country, some of the bridges near the tail might be used as stop-dams with practically the same effect.

10. I had the advantage of the assistance of Major Palmer and Captain Ottley, in sketching out a possible arrangement of *wárs* for a distributary, and the conclusions arrived at were as follows :—

Major Palmer states that any arrangement for distribution of water must be based on the week as a unit, and that waterings at intervals of 14 days might be considered as obligatory. The sum of the *wárs* on a distributary must therefore be 14 days. A cubic foot per second delivered at the head of a 'minor' for 24 consecutive hours will cover 6·8 acres of ground to a depth of $3\frac{1}{2}$ inches, and this is considered to be a sufficient watering for any crop. If the *wár* were fixed at *three* days, one cubic foot would water *twenty acres* in that time, and if *four* days, the area watered would be *twenty-seven acres*.

11. The distribution might be made thus—

(*a*). Minors run 3 days.
(*b*). " " 4 "
(*c*). " " 3 "
(*d*). *Sirkari* " 4 "

The groups (*a*) and (*c*) of 'minors' would be designed with a capacity of channel and the size of water-course heads would be fixed so as to give a watering as before described to the lands dependent on them at the rate of $\frac{\text{allowable irrigation in acres}}{20}$, and group (*b*) at the rate of $\frac{\text{allowable irrigation in acres}}{27}$, and, owing to this distinction between the groups, the *wars* of any distributary would be practically inviolable.

The term "allowable irrigation" is used to meet the case of new irrigation ; it really signifies the largest number of acres which it is proposed to irrigate in any one fasl.

The size of the openings for the water-course heads would be proportioned to the areas to be watered, and for the same area would be smaller near the head than if placed lower down in a 'minor.' Also in groups (*a*) and (*c*) the average size of openings would be larger than in (*b*) group.

12. The loss by evaporation and absorption between the head of the distributary and that of the water-course must be compensated by giving additional capacity to the distributary. Mr. Beresford, Executive Engineer, calculated that under the system employed in the North-Western Provinces this loss was as high as 33 per cent., but it is believed that under the system now proposed, the water being carried so much further in bulk, the loss will not amount to more than 20 per cent.

13. I think that by this system the necessity for openings carefully graduated to suit the areas to be irrigated will to a great extent disappear. These small openings are not liked by the natives, as they have to sit for days in their fields to watch the irrigation of a few areas. There is also a very great loss in carrying small bodies of water in village water-courses, and when these are long, it is impossible to *tatil* them at all in dry seasons.

Under the system now proposed, the whole body of water in the channel will be distributed into a certain number of short 'minors' of considerable capacity and thence into short village water-courses capable of carrying appreciable quantities of water, and I think that the great desideratum of a full and quick watering will thus be obtained.

14. Another advantage will be that with locks on the gates of the 'minors' there will be no difficulty in establishing a *bundi* ; there will be no surreptitious waterings, and every man will know that as long as the water flows past his water-course head he is at liberty to use it. There will be a stated time

for opening and shutting each 'minor,' and with the gate keys in the hands of a well.paid official, and the channels kept in good order, the Canal Officer would feel that he is absolute master of the distribution, and the villagers would be ready to do their irrigation at the appointed times and have leisure for their other duties.

15. As on the Butana Canal, irrigation officials will enquire from the villagers the areas that they propose to irrigate, and the gauges of the several 'minors' would then be settled for the season. As the water only reaches them once a fortnight, it is most probable that the village community will find it necessary to make up their mind beforehand as to the field they will irrigate, and not speculate on the probability of rain as they do now, and this may even pave the way to contracts. The power of the Subordinate Canal officials will be much lessened.

16. In designing a new distributary in a hitherto unirrigated tract, the number and position of the 'minors' would be considered at the time of aligning the distributary and its branches. The possible areas (taken at a fixed proportion of the irrigable and culturable area in each village) would be worked out for each 'minor,' and the cubic feet per second of water for the irrigation of the proportion of the area due to each fasl would be calculated. After dividing the cubic feet thus obtained by three for the number of *wárs* (as decided on above), an addition of 20 per cent. to cover loss by evaporation and absorption will give the capacity of the distributary at its head. The carrying power of the channel at other points of its length will depend on the manner in which the groups of 'minors' for each *wár* are made up, and there will be no difficulty in arranging this in the most desirable way.

17. The only matter which is antagonistic to the above manifest advantages is that the cost of constructing the 'minors' must be added to that of the distributaries. I do not think that the additional expenditure will be great and believe that it will be much more than covered by the value of the water saved.

18. Looking at the scheme as a whole it appears to be just one step in advance. In early days the villagers irrigated direct from the Canals. The next step was to give openings in distributaries. I now propose to bring the water still nearer to the fields by the construction of 'minors' and make the distributaries as well as the Canals carrying channels.

19. I entirely concur with General Gulliver in thinking that the villagers themselves would be the first to object to the perpetuation of system of cultivation described by the Settlement Commissioner in his letter to the address of the Financial Commissioner, which however well adapted it may be to their present condition of dependence on rain-fall alone, will not, in my opinion, be desired by the cultivators when a supply of water is assured to them. However, under the system of distribution which I have proposed, there will be no interference in this direction on the part of the Canal Department, as the internal distribution of the water will be left in the hands of the village community.

20. The following proposals for arranging the distribution of water are based on those detailed on pages 2 and 3 of General Gulliver's note, and are in many instances given in his own words; the alterations are due to the necessities of the new system :—

Experienced Canal Executive and Revenue Officers will be required to supervise the work and to instruct the villagers in its details.

In cases where distributaries from British branches pass entirely through the lands of a Native Chief, I am of opinion that, unless such a course is distinctly objected to by the Chief, it will be our duty to introduce the same system of irrigation as in our own villages, and when this has been well established, encourage him to contract for the supply entering the channel. Any contract of this kind must be based on the average returns from irrigation in British territory, and if the Chief be left to work out his own system, it is not probable that the results will be equal to those derived from any of the well-considered systems now in force on our permanent Canals.

21. The proportion of a village area that should be watered may be varied in proportion to the depth of spring-level and to the average rain-fall; the district through which the Canal passes being divided into zones for this purpose, and water granted for 20, 25 and 30 per cent. of area in the respective zones.

22. In order to find out the amount of water to be allotted to a village the Canal Officer will mark off on the village map (*shajrah)* the irrigable area He will deduct a portion of land for each well that is used for cultivation; this area will vary from 8 to 20 acres according to the depth of the well. On well lands the use of Canal water should be prohibited, and in case of the owner of such land using it, he should be punished under the Canal Act for unauthorized use of water.

After also deducting the area under the village site and of unculturable lands, he will fix the area for which water will be granted to the village at the sanctioned proportion of the balance of the irrigable area.

He will take from the list of estates (*khewat khatauni*) the numbers of all the fields in each estate which remain after the deductions before described have been made from the irrigable area, and will record the right of these portions of the various estates to the use of Canal water.

23. From consideration of the levels of the country and position of the lands to which water is to be given the Canal Officer will then locate in the minor distributary the one or more water-course heads which will be required for the village, and he will indicate the best lines for the village water-courses. The size of the openings in the bank of the minor will be fixed by considerations which have before been explained.

24. The Canal Executive and Revenue Officers having explained to the villagers the system on which water will be given from the distributary, they will be left to arrange the internal distribution among themselves. They will be instructed to avail themselves fully of the advice of the Canal officials on all matters of difficulty, and when they have decided on the details of the division of the water, their agreement will be recorded in the office of the Canal Division to which the village may belong. Any subsequent alteration in the agreement must receive the sanction of the Canal Officer.

25. General Gulliver on pages 3 and 4 of his note deprecates the division of the water-rates into owners' and occupiers' rates, and states that, whatever was the intention of the arrangement as regards the incidence of the charges on landlords and tenants, practically in this Province either the occupier pays the whole rate, or the owner and the tenant come to an agreement on the subject, and he therefore sees no use in the extra labour and trouble which the assessment of the separate rates entails.

The owner's rate has been declared to be a Canal asset due to the Canal operations, and as this is the case, there now appears to be no reason for separating it from the occupier's rate. I understand that orders have been lately received from the Government of India under which cesses for roads, schools &c., can be levied on the owner's rate; but even under these circumstances I can see no reason why these cesses should not be levied on whatever proportion of a consolidated water-rate may be considered according to the conditions of the tract affected, to be suitable.

I agree with General Gulliver in thinking that with a divided rate there will be a great risk of losing one part of it on the Sirhind Canal, as has already been the case on the Western Jumna Canal.

As I have no means of judging what proportion the owner's rate should bear to the occupier's rate in the tracts watered by the Sirhind Canal, I have limited my proposals to a consolidated rate for each class of crops.

26. I agree with the opinion expressed by General Gulliver and other officers of this Department that rice should be included in Class I, and I also propose to include water-nuts in the same class, because they require as much, if not more, water than any other crop in the schedule.

I also concur in General Gulliver's proposed charge for crops grown on land which has received one watering before ploughing.

The rate for gardens has been fixed per crop; Indian corn, for the reasons stated by General Gulliver, has been placed in Class II.

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27. Whilst entirely agreeing with General Gulliver's remarks on the impolicy of fixing the rates too low in the first instance, I think that an equal unsettled state will follow any alteration whatever in the rates. It is, I think, a great object to impress the cultivator with an idea of fixity whenever it is possible to do so. I have, therefore, from consideration of the rates levied elsewhere, and bearing in mind that the Agra Canal rates are said to have hindered the spread of irrigation in the first instance, fixed my rates rather lower than those proposed by General Gulliver.

28. A table of proposed rates is appended.

PROPOSED RATES FOR THE SIRHIND CANAL.

		Water-rate. Rs.
CLASS I—		
Sugarcane, per crop ... Rice, per crop ... Water-nuts, per crop ...	flow =	7 8 0
	lift =	5 0 0
CLASS II—		
Indigo, tobacco, poppies, vegetables, gardens, orchards, Indian corn.	flow =	4 8 0
	lift =	3 0 0
CLASS III—		
Cotton, fibres, all dyes *except* indigo; all rabi crops *except* gram and masur.	flow =	3 12 0
	lift =	2 4 0
CLASS IV—		
All kharif crops not specified above and of rabi crops, gram* and masur.	flow =	2 10 0
	lift =	1 12 0
CLASS V—		
Single watering before ploughing for fallow lands ...	flow =	1 2 0
	lift =	0 12 0
CLASS VI—		
Single watering if the ground be afterwards sown, but not again watered from Canal	flow =	2 4 0
	lift =	1 8 0

NOTE.—In the above the lift rate is calculated at two-thirds of the flow rate.

No. 6533, dated 26th November 1881.

From—Captain J. W. OTTLEY, R. E., Offg. Superintending Engineer, Bari Doab Circle,
To—The Joint-Secretary to Government, Punjab, Public Works Dept., Irrigation Branch.

IN reply to your No. 2545 I., dated 8th July 1881, on the subject of rates to be levied on the British branches of the Sirhind Canal, I have the honor to forward a copy of a letter No. 1951, dated 31st August 1882, from Executive Engineer, 2nd Division Bari Doab Canal, enclosing a note recorded by Mr. Catton, and a copy of Executive Engineer, 1st Division's No. 2422, dated 13th October 1881.

2. I submit these documents, as although I by no means endorse all that they contain, still I am of opinion that both of these are extremely valuable.

3. I proceed to record my own views on the points raised by you for discussion.

4. With reference to your 1st paragraph, I think the facts brought forward by the Executive Engineer show that the rates for both wheat and Indian corn would bear raising on this Canal by about Re. 1 per acre each; but I think at the same time that any *change* of rate has the effect of unsettling the minds of cultivators, and to this I attribute the great falling off in rice and sugarcane brought to notice by Mr Catton. I do not think the rates for these crops excessive, but I think the "change of rate" frightened the people more than we generally believe. On these grounds I should deprecate any change at present on *this* Canal.

* Gram alone; if mixed with barley or any other rabi crop to be charged under Class III.

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5. As regards the question asked in your 2nd paragraph I am distinctly of opinion that on a new Canal we should *at first* only charge occupiers' rates, and that these ought to be pitched fairly high so as not to leave too much room for enhancement of rents. This enhancement must and will take place, and I think that at the next settlement following the introduction of Canal-water, the Canal should get in the shape of "owners' rates" that fraction of the increased rent which is properly demandable by Government as chief landlord.

6. I sincerely trust that this view will be accepted, and if it be so then I would suggest the following as the rates at which the various crops should be charged. The rates I have arrived at are approximately in most cases the one-tenth value of the produce (spoken of by Mr. Catton), and frequently agree very closely with the *total** rates as now levied on the Bari Doab Canal :—

I.	Sugarcane	Rs. 7-8-0	per acre.
II.	Rice	" 6-8-0	"
III.	Wheat	" 5-0-0	"
IV.	Present Class III., but including Indian corn	" 4-0-0	"
V.	Present Class IV., excluding Indian corn ...	" 3-0-0	"
VI.	Single watering before sowing	" 2-8-0	"
VII.	Single watering to fallow lands *not afterwards sown*	" 1-8-0	"

7. If it be decided to levy both owners' and occupiers' rates, they should be so pitched as to reach the above total.

8. The statements asked for in your 3rd paragraph are given as enclosure to Mr. Catton's note.

Enclosures sent.

Executive Engineer, 2nd Division, Bari Doab Canal's No. 1951, dated 31st August 1881, with enclosure.
Ditto 1st ditto ditto " 3422 " 13th October 1881, with enclosure.

No. 1951, dated 31st August 1881,

From—J. E. CATTON, Esquire, Executive Engineer, 2nd Division, Bari Doab Canal,
To—The Superintending Engineer, Bari Doab Circle.

IN reply to his No. 4421, dated 21st July 1881, forwarding a copy of Joint-Secretary's No. 2545. dated 8th July 1881, regarding water and water-advantage rates proposed to be levied on the Sirhind Canal, has the honor to forward a note on the subject by Executive Engineer.

A list giving the information asked for in paragraph 3 of Joint-Secretary's letter above quoted is also submitted herewith.

Note by J. E. CATTON, Esquire, Executive Engineer, 2nd Division, Bari Doab Canal, on water rates to be levied on the British Branches, Sirhind Canal.—dated 31st August 1881.

IN reply to the first question as to whether the existing water-rates on the Bari Doab Canal have been found suitable or whether they have tended to foster or retard the growth of any particular crop, a statement showing the area and percentage of each class, compared with the total area irrigated in this division, is enclosed.

From it is clearly seen the effect of changing the rates of crops Classes I. and II. in 1870. Although rice is (even with the increased rates) one of the best paying crops, it will be seen that the percentage under Class II. is still lower than it was before the enhanced rate were levied.

This proves that any change in the rates affects the minds of the cultivators more than one would suppose, considering simply the profit and loss aspect of the question. Wheat is the principal crop, but its high percentage is due as much to the high rate at which it has sold lately in consequence of famine and improved communication as to raising the rates of other classes. A wheat crop too on virgin soil pays very well, and in view of the new rajbahas and extension of irrigation in the Lahore district, it is not surprising that the wheat area should have increased.

* By total I mean the sum of "water" and "water-advantage" rates.

2. Again, in very dry seasons the percentage of fodder crops rises—note 1877-78 for instance—just as it falls in seasons of plentiful rain-fall.

3. From the results shown in the enclosed statement it may be concluded that raising the rates on Classes I. and II. has had permanent effect in reducing their area. As regards Class II., the principal crop of which is rice, this is a result much to be desired, and therefore as the table shows no abnormal increase or decrease in the percentage of any of the other classes, no change in the present rates appears desirable, or in any way called for.

4. Paragraph 2 of the Joint-Secretary's No. 2545, dated 8th July 1881, asks for an opinion regarding the advisability or not of dividing the water-rates to be levied on the Sirhind Canal into owners' and occupiers' rates.

5. When it is considered that the latest ruling on the subject of owners' rate only allows it to be assessed where and when occupiers' rate is charged; and moreover, when it is remembered that the land to be irrigated by the Sirhind Canal is entirely new and unirrigated, in which there can be no rights or previous high assessments as on old Canals to be interfered with, there appears to be no reason (especially where the Canal belongs to Native States) to separate the two charges.

6. The object of the owner's rate is to distribute the charges between those who benefit from the use of the water, and we may take it for granted that in a new country the cultivator will be the one who benefits; because until a revision of settlement it is unlikely that a landlord will be able seriously to enhance the rent of his land.

7. On the Western Jumna Canal, Government has lately sanctioned the owner's rate being assessed at a fixed proportion (namely, half) of the occupier's rate; this solution therefore takes no account of the different kinds of land cultivated, as is the case in assessing the water-advantage rate on the Bari Doab Canal. When the zamindars in the tracts irrigated by the Sirhind Canal get water, they will probably apply it to their best land. If therefore water is distributed in an intelligent manner, there would appear to be no reason for varying the rate with the soil or district, or separating that payable by the occupier from that payable by the owners.

8. If it is desired, as elsewhere, to discourage the Canal irrigation of lands which are already irrigated from wells, no reduction on the water-rate for such lands should be made.

9. Regarding the amount of the rate to be fixed, the fairest way and the way best understood by the villagers is to fix the rate at a certain fraction of the value of the produce.

Taking the gross value of produce and gross direct or indirect charges for irrigation on the Punjab permanent Canals, this fraction is not far from one-tenth. This should be made the basis of calculation in fixing the new consolidated rate and the proportionate charges for the different classes at present levied on the Bari Doab Canal adhered to.

10. To develope the Sirhind Canal quickly, and ensure its success in some measure as a commercial speculation, a low rate might be imposed first, and an owner's rate subsequently under Section 37 of the Canal Act.

If the Canal is to be looked on as a permanent benefit to the country, changes of any kind are dangerous, and the irrigation should, above all things, be extended slowly and gradually in all the districts through which the Canal passes.

2nd DIVISION, BARI DOAB CANAL.

Statement showing the area irrigated in acres and percentage of each class for each year from the year 1865-66 up to 1875-76.

...s.	1865-66.		1866-67.		1867-68.		1868-69.		1869-70.		1870-71.		1871-72.		1872-73.	
	Irrigation.	Percentage.	Irrigation.	Percentage.	Irrigation.	Percentage.	Irrigation.	Percentage.	Irrigation.	Percentage.	Irrigation.	Percentage.	Irrigation.	Percentage.	Irrigation.	Percentage.
	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
...	4,315	3·51	3,983	2·19	4,685	2·29	4,605	1·87	4,810	2·67	Rates 2,350	raised 0·93	2,642	1·01	5,178	2·51
...	25,858	21·01	37,428	20·63	42,483	20·80	32,864	13·26	55,958	31·01	19,704	7·79	9,389	3·57	20,805	10·10
...	58,527	47·56	114,466	63·09	130,576	63·93	167,723	68·20	96,710	53·60	167,543	66·20	189,175	71·95	131,920	64·05
...V.	34,344	27·92	25,567	14·09	26,498	12·98	41,070	16·67	22,960	12·72	63,482	25·08	61,712	23·47	48,070	23·34
...	123,044	...	181,444	...	204,242	...	246,262	...	180,438	...	253,079	...	262,918	...	205,973	...

...s.	1873-74.		1874-75.		1875-76.		1876-77.		1877-78.		1878-79.		1879-80.		1880-81.	
	Irrigation.	Percentage.	Irrigation.	Percentage.	Irrigation.	Percentage.	Irrigation.	Percentage.	Irrigation.	Percentage.	Irrigation.	Percentage.	Irrigation.	Percentage.	Irrigation.	Percentage.
	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
...	5,442	2·67	4,614	1·78	4,692	2·36	4,732	2·46	3,863	1·58	5,418	1·86	6,083	1·83	7,168	2·07
...	23,305	11·42	21,914	8·64	20,269	10·17	23,735	12·36	18,391	7·50	28,363	9·77	30,710	9·29	31,080	8·99
...	128,366	62·90	167,928	66·19	129,565	65·01	120,121	62·57	150,244	61·25	196,228	67·58	206,149	62·41	216,751	62·70
...V.	46,954	23·01	59,332	23·39	44,771	22·46	43,411	22·61	72,814	29·67	60,363	20·79	87,329	26·47	90,728	26·24
...	20,407	...	253,690	...	191,297	...	191,999	...	245,312	...	290,372	...	330,271	...	345,727	...

(Sd.) J. E. Catton,
Offg. Executive Engineer, 2nd Division, Bari Doab Canal.

Amritsar:
...ed 31st August 1881.

Tabular Statement of the rates at present levied on the 2nd Division, Bari Doab Canal, for the several Crops under the Heads of—

Class.	Name of Crop.	Occupier's rate per acre.	Water-advantage rate.	Total per crop. Varies From	To	Remarks.
		Rs. A. P.		Rs. A P	Rs. A. P.	
Class I. ...	Sugarcane ...	6 0 0	Varies with the soil and district, but remains the same for each class of crop.	7 8 0	6 12 0	The occupier's rate for flow irrigation is as shown in this list, and for lift it is half this amount.
„ II.	Rice ...	4 12 0	Ditto.	6 4 0	6 8 0	Half water-advantage rate is charged on twice cropped land during the second crop. No water-advantage rate is charged on land assessed as well irrigated.
	Garden ...	*4 12 0				
	Kharif Crops.					
„ III. ...	Cotton ... Hemp ... Indigo ... Turmeric ... Til (Sesamum) ... Vegetables ... Water-nuts ... Orchard or plantation of fruit trees ...		Rs. A. P. Gurdaspur ... 1 2 0 Amritsar ... 1 0 0 Lahore—Superior land. 1 8 0 Lower land... 1 2 0 Maugha Mitha ... 1 0 0 Maugha Khara ... 0 12 0			* For gardens the charge is water-rate for each half-year, plus full water-advantage rate in kharif and half in rabi, provided the garden is on barani land, and, if on *well* land, no water-advantage rate is to be charged.
	Rabi Crops.					
	Wheat ... Barley ... Linseed ... Sarson (*Sinapis campestris.*) Taramira (*Sinapis eruca*). Mustard *Brasica* ... Poppies ... Tobacco ... Tukham-malanga ... Safflower ... Vegetables ... Chillies, &c. ...	2 8 0	...	3 4 0	4 0 0	
	Kharif Crops.					
„ IV. ...	Jowar (great millet), Bajra (spiked „) Kangni (Italian „) Maize, not elsewhere mentioned.					
	Rabi Crops.					
	Gram (*Cicer arietinum*) Masur (*Ervum Lens*) Urad or mash Grasses ... Sinji (medicago), not elsewhere mentioned. Fallow land ... Rabi crops not receiving water after December.	1 8 0	...	2 4 0	3 0 0	
„ V. ...	A single watering before sowing, or to fallow land ...	0 12 0	...	1 8 0	2 4 0	

Amritsar: }
The 31st August 1881. }

(Sd.) J. E. Catton,
Offg. Exec. Engr., 2nd Division, Bari Doab Canal.

No. 2422, dated 13th October 1881.

From—Sidney Preston, Esquire, Executive Engineer, 1st Division. Bari Doab C

To—The Superintending Engineer, Bari Doab Circle.

In reply to your No, 4420 dated 22nd July 1881, I have the offer the following remarks on the subject of water and water-advanta levied on this Division of the Bari Doab Canal.

In reference to this question, it appears to me incorrect that the ra should be uniform throughout all the districts watered by the Canal in land assessments vary considerably ; or, if a uniformity of the wate considered a desideratum, then the water-advantage rate should be assess a rate in reference to the land assessment as will leave the margin of pro cultivator in all cases much about the same.

2. Thus, in parts of the Gurdaspur District the land revenue is as about Rs. 3-8-0 per ghomao, while in the Kasur Tahsil of the Lahore also watered by this Division, it amounts only to 3 annas to 4 annas per and yet the water-rates charged are the same in both cases, and th advantage rate, as will be seen by the table attached, is absolutely le latter than the former district.

3. The cost of irrigating an acre of wheat in the Gurdaspur Distr amount to—

	Rs. A. P.
Land revenue, say	4 0 0
Water-rate	2 8 0
Water-advantage rate	1 4 0
Total ...	7 12 0

While in the Kasur Tahsil it would amount to—

Land revenue, say	0 5 0
Water-rate	2 8 0
Water-advantage rate	0 12 0
Total ...	3 9 0

i. e., less than half, and in this no account is taken of the various ce of which will be greater in the first instance.

4. The reason of the low assessment in the latter district is, of cou absence of irrigation in any form at time of settlement, either by direct r which was invariably very scanty and often almost *nil*, from springs or channels containing perennial streams or wells, the depth of water in wh prohibitive of much irrigation. The introduction of Canal-water into that has, however, given the people the very thing they required to render the as good and as certain of raising good crops of the same kind as in the more assessed district of Gurdaspur, and it is not therefore apparent why the cul instead of the Canal, should reap the entire benefit, since, to put it in a commercial manner, the Canal could have sold its water at the same rate with trouble and expense of carrying it so far.

5. This also appears to me to determine the advantage of retaining the advantage rate as a separate rate. If used, as I say, as a fluctuating rate to m for the inadequacy of the land assessment under the alteration caused by t introduction of irrigation, its retention appears to be advisable, and it wou really be a "water-advantage rate"; but under the exsising system it is real a fixed addition for each Tahsil to the water-rate, and I can see no practical p served by retaining it as a separate rate, and it certainly gives greater labo preparation of the demand statements and parchas.

6. In reference to the amount of the rates, there are three crops which are at present under-assessed, *viz.*, rice, wheat and Indian corn.

7. My delay in answering this letter has arisen from my desire to prove figures, but even now I find this difficult. I am, however, confirmed in my not only by that of Rai Gurmukh Singh and the more experienced of my Zi but by the statement of cultivators themselves, who, when assured that my e had no reference to this Canal, admitted that the yield and profit from thes would fairly bear an increased rate.

8. In considering this question I have noted the following facts that bear on it :

1st.—*Regarding Rice.*—The only labor required is that of preparing the ground and planting; after that it is simply necessary to turn on the water. It required no manure, no hoeing, no watching, since neither cattle nor birds eat it, and it only occupies the land for at most four months; and, finally, the thorough soaking the land receives enables gram or barley to be sown and come to maturity without the absolute necessity for irrigation. It is true it requires a good deal of water, but only at a time when there is plenty to spare in the river. Taking these points into consideration, I think it might fairly in a new district be classed as a first class crop along with sugarcane.

2nd.—*Wheat.*—This only takes a moderate amount of water, but the increased yield due to irrigation is so great as to enable it to bear a higher rate; and in the Ferozepore District of the Sirhind Canal, which is essentially a wheat country, this will probably be even more so than on this Canal.

3rd.—*Indian Corn.*—The above remark applies equally to this crop; irrigation is almost a necessity to its growth, and when obtained so enhances its out-turn that it would fairly bear to be classed as a 3rd class crop at Rs. 2-8 per acre.

9. In the enclosed table, I have shown the results of my enquiries as to the cost and yield of the crops above referred to. I do not vouch for it as absolutely correct; but I am under the impression it is not very far wrong. It will be seen that I have taken the land assessment at the highest rate, but have not added the percentage for local cesses, as I am not aware what these amount to.

10. In conclusion, I have to express my regret at the delay which has occurred in answering your letter, and fear that after all I have been able to add nothing to what was before already well known.

Statement showing Water-advantage Assessments per acre in the various Tahsils watered by the 1st Division, Bari Doab Canal.

District.	Tahsil.	Water-advantage rate per acre. Rs. A. P.	Remarks.
Gurdaspur ...	Pathankot ...	1 4 0	
	Gurdaspur ...	1 2 0	
	Batala ...	1 2 0	
	Amritsar ...	1 0 0	
	Tarn Taran ...	1 0 0	
	Kasur ...	1 0 0 0 12 0	

Statement showing Appoximate value of out-turn of the following Crops per acre.

Crop.	Average out-turn undeer irrigation.	Rate per rupee.	Value.	Value of bhusa.	Total value.	Deduct cost.	Net balance.	Usual rate of compensation paid in case of damages, and which represents the cultivator's fair profit.	Equivalent per acre.	Excess over and above fair profit.
	Mds.	Srs.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
Rice ...	40	24	66 11 0	...	66 11 0	22 0 0	44 11 0	2 8 0 per kanal	24 1 0	20 10 0
Wheat ...	30	24	50 0 0	4 0 0	54 0 0	19 0 0	35 0 0	3 0 0 do.	29 0 0	6 0 0
Indian corn.	24	24	40 0 0	5 0 0	45 0 0	18 4 0	26 12 0	1 8 0 do.	14 8 0	12 4 0

Statement showing Approximate cost of cultivation of the following Crops per acre.

Crop.	No. of ploughings.	No. of ploughs.	Rate per day.	Cost of ploughing.	Cost of seed.	Hoeing.	Sowing and cutting.	Watching.	Land revenue, say.	Water-rate.	Water-advantage.	Total cost.
			Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
Rice ...	6	3	0 8 0	9 0 0	0 8 0	...	2 12 0	...	4 0 0	4 12 0	1 0 0	22 0 0
Wheat ...	6	3	0 8 0	9 0 0	0 8 0	...	2 0 0	...	4 0 0	2 8 0	1 0 0	19 0 0
Indian corn	5	3	0 8 0	7 8 0	0 4 0	1 8 0	1 8 0	1 0 0	4 0 0	1 8 0	1 0 0	18 4 0

C. No. 211 I., dated 11th September 1881.

From—Major R. H. PALMER, S. C. Superintending Engineer, Western Jumna Canal,

To—The Joint-Secretary to Government, Punjab Public Works Department, Irrigation Branch.

IN reply to your No. 2546 I. dated 8th July 1881, requesting my opinion regarding the existing water-rates on the Western Jumna Canal.

2. I have the honor to observe, first, that the recent introduction of the assessment of the owner's rate has for the present so disarranged the ordinary course of things that it is difficult to determine yet whether they have had any tendency to unduly foster or retard the cultivation of any particular crop.

3. I append a tabulated statement of the rates at present levied on the Western Jumna Canal under the separate heads of "occupier's, and owner's" rates; and with reference to your enquiry as to whether I would recommend any alterations to them, I beg to submit the following suggestions.

4. Under Class II., I consider the rate for rice and water-nuts is too low, and should be raised to the rate for Class I. for the following reasons.

5. In the case of rice cultivation, the lavish expenditure of water should be checked; and also, as the charge for "sailabi," which was formerly allowed, is now declared to be illegal, and has been discontinued, it is necessary that the full value of the water taken for the rice crops should be realized for this crop. In the case of water-nuts, the present rate is out of all proportion too low: when the consumption of water required for its cultivation is taken into consideration, I estimate the quantity required is nearly three times that required for tobacco, poppies, or vegetables.

6. Under Class V. I consider some difference should be made between land that is not sown after the first watering and that which is sown: it frequently happens that if the season is favourable, especially during the rabi crop, a single watering before sowing, will enable a crop to be sown and come to maturity without any further irrigation. I would suggest that, in the case of land which is sown after the first watering, and not watered again during that crop, double the rate for a single watering should be assessed: the rate thus raised would even then be less than the rate for a fully irrigated crop of the third class.

7. Regarding your enquiry as to the advisability of keeping the "occupiers' rates" and "owners' rates" separate as at present, or combined in one charge, I strongly recommend that the latter course should be adopted in all lands that are to be assessed with water-rates for the first time: the extra labor involved by keeping these rates separate is very considerable, and there does not appear to be any corresponding advantage to the Irrigation Department in keeping them separate.

Tabulated Statement of the Water-rates levied on the Western Jumna Canal, 1881.

CLASS AND NAME OF CROP.	RATE PER ACRE.					
	Flow.			*Lift.*		
	Occupier's.	Owner's.	Total.	Occupier's.	Owner's.	Total.
Class I—	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
Sugar cane, per crop. ...	5 0 0	2 8 0	7 8 0	3 5 4	1 10 8	5 0 0
Gardens, per annum ...	5 0 0	2 8 0	7 8 0	3 5 4	1 10 8	5 0 0
Class II—						
Rice, per crop ...	3 0 0	1 8 0	4 8 0	2 0 0	1 0 0	3 0 0
Tobacco, per crop ...	3 0 0	1 8 0	4 8 0	2 0 0	1 0 0	3 0 0
Poppies, " ...	3 0 0	1 8 0	4 8 0	2 0 0	1 0 0	3 0 0
Water-nuts " ...	3 0 0	1 8 0	4 8 0	2 0 0	1 0 0	3 0 0
Vegetables " ...	3 0 0	1 8 0	4 8 0	2 0 0	1 0 0	3 0 0
Class III—						
Indigo, per crop	2 4 0	1 2 0	3 6 0	1 8 0	0 12 0	2 4 0
Cotton, " ...	2 4 0	1 2 0	3 6 0	1 8 0	0 12 0	2 4 0
All Rabi crops ...	2 4 0	1 2 0	3 6 0	1 8 0	0 12 0	2 4 0
Class IV—						
All Kharif crops not specified above ...	1 10 8	0 13 4	2 8 0	1 0 0	0 8 0	1 8 0
Class V—						
A single watering before sowing ...	1 0 0	0 8 0	1 8 0	0 10 0	0 5 0	0 15 0

No. C 371 W., dated 5th September 1881.

From—Col. H. A. BROWNLOW, R.E., Secretary to Government, N.-W. P. and Oudh, P. W. D.,

To—The Joint-Secretary to Government, Punjab, P. W. D., Irrigation Branch.

In reply to your letter No. 2544 I. of the 8th July 1881, I am directed to forward a copy (with five spare copies) of a Note, No. C 340½ W. of the 20th August 1881, by the Chief Engineer of Irrigation Works, North-Western Provinces and Oudh, on the question of water-rates to be levied on the British branches of the Sirhind Canal.

Note by Chief Engineer of Irrigation Works, North-Western Provinces and Oudh, No. C340½W., dated 20th August 1881.

THE Punjab Government asks for my opinion regarding—

(1.) The existing water-rates on the Canals in these Provinces; whether they have been found suitable, or whether they have had any tendency unduly to foster or retard the growth of any particular crops; also whether I would now recommend any alteration if the rates were to be revised.

(2.) The form in which the water-rate should be levied in a tract where Canal-irrigation is about to be introduced for the first time; whether it should be divided into occupier's and owner's rate, or should be levied in one combined charge for occupier's rate.

In considering this question especial regard is to be had to the case of the Sirhind Canal, where much of the land to be irrigated belongs to Native States.

(3.) A tabulated statement is also asked for showing, for the several crops and Canals, the amount per acre of—

(1.) Occupier's rate.
(2.) Owner's rate.
(3.) Total charge.

2. The statement appended to this note shows the occupiers' rates charged on the several Canals of the North-Western Provinces for the different kinds of crops grown. The owner's rate is uniformly assessed at one-third of the occupier's rate on land actually irrigated during any *fasl*, and the total charge on such land—where owner's rate is taken—is therefore 1⅓ of the occupier's rate.

3. Owing to this method of assessing the "owner's rate" it is, so far as my knowledge goes, almost invariably transferred at once, on the Lower Ganges and Agra Canals, by the landlord to the occupier as an additional charge for the water which the latter must pay; and I have little doubt that by most cultivators on these two Canals 1⅓ of the occupier's rates sanctioned by Government are considered to be the real charges for the water.

4. During any time of drought the Canal-water is readily taken at even these enhanced rates for all except perhaps the most inferior crops; but I consider that they have interfered with the natural development of the Canal irrigation during years of good, or even fair rainfall. The statement of areas irrigated on the Agra Canal from the year of its opening to 1880-81, which is given below, sufficiently illustrates the truth of this statement, the decrease in the area irrigated during the year of good rainfall (1879-80) being very marked and certainly beyond that which would have occurred with lower rates.

Statement of Irrigation on the Agra Canal.

NAME OF CROP.	Class.	*Areas in acres.*						
		1874-75.	1875-76.	1876-77.	1877-78.	1878-79.	1879-80.	1880-81.
Sugar cane	I.	...	403	1,407	3,070	6,703	2,937	1,067
Rice	I.	2	48	8	19	43	16	6
Gardens, &c.	II.	209	931	1,210	7,464	3,057	1,787	2,940
Indigo	III.	...	524	1,627	3,615	8,315	3,344	7,867
Cotton	III.	...	3,414	10,662	28,933	13,971	10,495	16,478
Rabi crops	III.	12,645	20,946	31,422	96,581	78,020	35,239	103,236
Inferior Kharif crops	IV.	...	904	3,340	22,741	12,433	2,706	8,461
Insufficiently irrigated and miscellaneous	IV.	2,270	64	132	1,211	1,036	673	1,350
Total ...	...	15,126	27,234	49,808	163,634	123,578	57,197	141,405

5. Whether the Agra Canal occupier's rates alone would prove too high a charge for land actually irrigated from the Sirhind Canal, is a question which my want of local knowledge of the tract commanded by it makes it very difficult for me to answer. Very much will depend upon the character of the cultivators inhabiting it, upon the quality of the soil and nature of the cultivation, the amount and distribution of the rainfall, and the cost of existing methods of irrigation. If the soil is, as a rule, fertile, if the cultivators are skilful and industrious, and the existing means of irrigation scanty, I should be inclined to put on the Agra Canal occupiers' rates from the outset. If, however, there are considerable areas of uncultivated land, and the cultivators are poor, living from hand to mouth, and largely accustomed to *barani* cultivation, they may be frightened by high rates, and hold off from taking Canal-water until a long drought drives them to it. The Canal might then remain for a considerable time quite unremunerative, unpaid interest accumulating all the while on the capital invested in it.

6. There is one point in connection with moderate water-rates which I think it well to notice here. The duties obtained from Canal-water, when employed in irrigating first-class crops, are very low (only about 40 or 50 acres per cubic foot per second for sugar-cane and rice); and the high duties reached on our Canals are obtained by giving one, or at the outside two, waterings to large areas of inferior crops, which thus run up the areas shown as watered per cubic foot per second of average volume, at the same time increasing notably the Canal revenue.

Now, the direct tendency of high water-rates is to exclude these inferior crop entirely from Canal-irrigation except in very dry years,* and there is yet another way in which high water-rates act in decreasing the light irrigation which pays so well in ordinary years. Water is frequently given, when water-rates are moderate, to improve the yield of a crop which will even, without the watering from the Canal, produce a very fair return. Natives calculate their income and expenditure far more closely than we are in the habit of doing, and the immediate effect of an increase in Canal rates is to check largely all irrigation of this kind, as no one will pay Rs. 3 for a watering which may only increase the value of his crop from Rs. 2 to Rs. 2-8-0 per acre.

* Compare the areas of fourth-class crops shown in statement in para. 4 as irrigated during 1877-78 (a year of drought) and 1879-80 (a year of good rainfall). On the Dún and Rohilkhand Canals, with their low rates, the irrigation of inferior crops often increases in a year of good rainfall, owing to the larger supply of water in the Canals.

7. If, having regard to the foregoing considerations, Agra Canal rates be considered too high to commence with for Rabi and inferior crops on the Sirhind Canal, I would recommend the adoption of the occupier's rates noted in the margin, until the cultivators get accustomed to the use of Canal-water and better able to pay high rates, when the Agra Canal rates might, if found advisable, be introduced for all classes of crops. Indigo should, however, be moved up from Class III. to Class II. of these rates, as it is well able to stand the higher rates.

Class.	Description of crops.	Per acre irrigated. Flow. Rs. A. P.	Per acre irrigated. Lift. Rs. A. P.
I.	Sugarcane and rice	6 0 0	3 0 0
II.	*Indigo*, tobacco, opium, vegetables, gardens, orchards, and water-nuts ...	4 0 0	2 0 0
III.	Cotton, fibres and all dyes except indigo All Rabi crops except gram and "masur."	2 8 0	1 4 0
IV.	All Kharif crops not specified above, and gram* and "masur" ...	1 8 0	0 12 0

* This means "gram" alone; when mixed with barley and other Rabi crops it will be charged under Class III.

8. In regard to the form in which the water-rate should be levied, *i. e.*, whether it should be divided into occupier's and owner's rate, or levied in one combined charge for occupier's rate, I may be permitted to quote here opinions which I expressed nearly five years ago, and which I have since seen no reasons to alter.

9. "There are many reasons which to my mind conclusively prove the advisability of not attempting to realise the full value of the water by one direct charge of water-rate.

10. "The argument that Canals should be managed on purely commercial principles, and that men should buy Canal-water as they buy manure, seems to me unsound. A Canal, by destroying most of the wells in its neighbourhood, virtually establishes for itself a monopoly of irrigation; it is also managed by the State, so that the appeal against the monopoly lies to the monopoliser. In such case management on purely commercial principles may easily degenerate into oppression, and a vast amouut of injury may be done before self-interest will allow the rulers to remove or even notice it; so that especial care should be exercised in pressing up water-rates to a maximum.

11. "Moderate water-rates increase largely the area irrigated (and therefore the duty done by the water and the Canal revenue) during years of moderate rainfall or of low prices. It has been objected to this argument that steadiness of Canal revenue will be far better secured by extended distribution than by moderate water-rates. The wider the distribution of Canal-water, the larger will be the area commanded of the more valuable crops, of which the irrigation is fairly constant and independent of the seasons. This argument is undoutedly sound, so far as the superior "kharif" crops (sugarcane, indigo, and the better kinds of rice) are concerned. But we must deal with facts as we find them, and must not forget that from one third to one-half of the total area irrigated from our Canals consists of "rabi" crops (wheat, barley, &c.); that the supply of water for these is very much more limited than that available for the "kharif" crops; and that widely extended distribution of a small supply of water means great waste from absorption in ordinary years, and a total break-down of the Canal system in years of famine.

12. "Canal-rates must from obvious considerations of expediency, be uniform for each class of crop. It would, for instance, be practically impossible in assessing them to take into consideration differences in the quality of the crops to

which the water had been applied,—differences arising, it may be, from the varying nature of the soil, from the style of cultivation, or even from unavoidable imperfection in the working of the Canal itself. All that the Canal Officer can do is to ascertain whether the crop has been irrigated from the Canal, and has come to maturity or not. Now, uniform rates applicable to large areas and various qualities of the crops must be moderate and based upon the profits attainable from an average quality of soil and crop, unless it is intended to exclude all but first class soils and cultivation from irrigation.

13. "To the argument that Canal irrigation ought to be restricted to first class soils and cultivation, in order that Government may obtain the highest possible returns for its expenditure, I reply that, even supposing a sufficiency of first class soils and cultivation to use up all the water available, both physical and agricultural considerations forbid our leading the water about in search of the best land and the highest market. Canal channels must follow the ridges of the country, and the water must be distributed within a reasonable distance from the source of supply, or great waste from absorption will ensue, while the best land and highest cultivation may lie a long way from the head of the Canal, or from the ridge occupied by a Canal channel. Confining Canal irrigation to first class land would interfere most injuriously with rotation of crops, and tend on the whole to impoverish the soil, for the cultivator would be prevented by the high water-rates from taking his best crops and cultivation round his farm. On this subject I cannot do better than quote Mr. Alan Cadell :—'To charge high rates with the special object of restricting cane and cotton to a very small area of highly manured land, would be to attempt to change the system of agriculture in the Upper Doab. A man might perhaps grow finer crops if he restricted the manure at his disposal to, say, one quarter of his land; but the average would be less good than at present, when the Jat of the Upper Doab takes his sugarcane round the whole of his irrigated land, and manures the whole of that land once in every three, four or five years, instead of half of it only in two.'

14. "The landlord in dealing with his tenant, and the Settlement Officer in dealing with the landlord, can and do take more or less into consideration the details of productiveness of soil and nature of cultivation with which the Canal Officers cannot concern themselves; so that by applying moderate water-rates we secure the fullest and most economical use of the Canal-water, avoid all chance of throwing poorer soils and crops out of irrigation, and leave an elastic margin of 'indirect' revenue (enhancement of land revenue due to Canals), which ought to give full credit to the department for all results obtained by it, while avoiding all risk of oppressive charges.

"By an 'elastic margin' of profit I mean that a certain portion of the Canal returns will be assessed and watched by officers having other interests than the mere financial success of the Canal,—who, by periodically reducing or increasing the amount of 'land revenue' due to Canals, will adapt the total demand of the State to the actual results of Canal irrigation in the fairest way.

15. "In conclusion, I may be allowed to notice an objection that has been urged against our present system of including a certain proportion of the income due to Canals in the land revenue. It is argued that the cultivator would benefit very considerably by heavy direct water-rates, which should include the increase in rent now observed by the landlord, if there were only a legal enactment to the effect that the landlord should have no claim to enhance rent on account of Canal irrigation unless he were himself called on to pay owner's rate or enhanced land revenue on that account.

	Rs.
For the cultivator now pays rent of land, say	4
Increased rent due to Canal advantages	3
Total rent ...	7
Water-rate	3
Total ...	10

And would pay under the proposed system—

	Rs.
Land-rent	4
Water-rate	6
Total ...	10

if he irrigated from the Canal. But if he did not happen to require Canal-water, he would only have to Rs. 4 land-rent, instead of the Rs. 7 which he would pay under the present system.

"This is undoubtedly true: but then the required legislative enactment is not in existence; and whether it would be either just or politic to introduce it, I take leave to call in question.

16. "It is asked, why should the landlord get any share of the increase in rent caused by a Canal towards the construction of which he has not in any way contributed? I think it is just to allow him a certain share of the increase, because the Canal is by no means an unalloyed gain. It causes great inconvenience in some cases by interference with freedom of communication, in others it deteriorates the lowlands by raising spring-levels, and in others again it takes away the power of making *kachcha* wells. If no profits are to be allowed to the landlords from the Canal, they ought in common justice to be fully compensated for all indirect losses and inconveniences. I think it is politic to allow them a share in Canal profits; for where we have large zamindars holding land cultivated by tenants-at-will, I do not see how Canal irrigation is to be introduced unless we give the zamindars some interest in it. If they see that its profits are to be shared entirely between the State and the cultivator, they will be either coldly indifferent or actively hostile to the Canal. In the latter case, Canal irrigation will not be introduced at all; in the former, I do not see who is to make the village water courses; certainly not tenants, who can be removed just as they are beginning to reap the fruit of their labour.

"Where villages are held by small proprietors cultivating their own lands, it is surely statesman-like policy to increase their prosperity by allowing them the landlord's share in the profits resulting from Canal irrigation, and to secure their loyalty by leading them to connect that prosperity immediately with the action of Government."

17. For these reasons I strongly recommend that on the Sirhind, and any other new Canal the charge for water should be divided into occupier's and owner's rate, and that the owner's rate should *not* be assessed, as it now is in these Provinces, by taking a certain proportion of the occupier's rate on land actually irrigated.

Finding the system in force in 1876, and attaching no importance to certain theoretical objections which had been raised against it while objecting strongly to frequent changes in the method of asseessing any part of the water-rate, I myself recommended the maintenance of a system which is undoubtedly open to the grave practical objection of producing the very increase of charge on land *actually irrigated* during any particular *fasl*, to which I take strong exception.* But I recommended its maintenance as a *purely temporary expedient*, to remain in force only until a revision of settlement would admit of the owner's rate being assessed, as it should be, in the same manner and on the same data as the land revenue; and I certainly would not now recommend the introduction of what is confessedly a "rough and ready" but unsound method of calculating the rate in a tract where Canal irrigation is about to be introduced for the first time.

* See para. 3 of this note.

18. "Owner's rate" is, I take it, simply a temporary expedient for securing, during the currency of a settlement, the Government share of the increase in rents produced by Canal irrigation which has been introduced since the settlement came in force. Such increase occurs over the whole area really commanded by the Canal and irrigable by it upon the necessity arising, not only on the particular fields

NOTE.—The almost exact coincidence of the rates recommended by me with those in force on the Bari Doab Canal will, of course, be at once observed. I may, however, mention that the rates suggested by me were arrived at by independent inquiry and calculation *in complete forgetfulness* of the rates on the Bari Doab Canal, which I ascertained afterwards. If owner's rate is assessed, as it should be, and as recommended in para. 18 of this note, I am positive that the above or Bari Doab Canal occupier's rates will not be found too high.

which may happen to be irrigated during any year or *fasl*. The present system of assessing the owner's rate entirely overlooks this fact. I would therefore put on such occupier's rates as may be deemed suitable for the Sirhind Canal, watch the rents in the tract irrigated by it, and, as recommended by Mr. C. J. Lyall in his admirable note on owner's rate, have a rapid approximate settlement of land revenue due to the Canal made at periodical intervals during the currency of the major settlement, until the limit of Canal irrigation had been fairly reached. The minor and intermediate settlement should, in my opinion, proceed upon a consideration of the *actual* increase in rent; and, if the zamindar has not enhanced, we should—for some time at any rate—be very cautious in compelling him to do so. As soon as the Canal irrigation had become fully developed, and the increase of the land revenue due to the Canal had reached a limit beyond which it would not be likely to advance with any considerable rapidity the amount of enhancement of the land revenue due to the Canal would remain fixed during the currency of the revenue settlement, the Canal getting its book credit for the sum. By proceeding in this manner, we should, I think, obtain the full and fair value of the Canal-water, with the least delay and inconvenience to those who pay the Canal revenue.

19. If the system recommended above is the soundest and best that can be adopted for levying water-rates on Canal irrigated land in our own territory, I do not think that it will be wise to alter it because much of the land to be irrigated from the Sirhind, or any other Canal belongs to Native States. It will be far better to give such States separate channels, distributaries or water courses, charging a lump sum for the volume entering such main or minor channels, leaving the details of distribution and assessment entirely to the native government, and accepting, if necessary, any small loss thereby entailed on the British Government, than to depart from sound principles in dealing with our own people.

GOVERNMENT, NORTH-WESTERN PROVINCES, PUBLIC WORKS DEPARTMENT, IRRIGATION BRANCH.

Memo. of Water-rates in force in Canals of the North-Western Provinces.

Class.	Nature of Crops.	Per acre irrigated. Flow. Rs. A. P.	Per acre irrigated. Lift. Rs. A. P.	Per.
	I.—Ganges and Eastern Jumna Canals.			
I.	Sugarcane and rice ...	5 0 0	3 5 4	Year.
II.	Tobacco, opium, vegetables, gardens, orchards, and water-nuts ...	3 0 0	2 0 0	Crop.
III.	All Rabi crops, indigo, and cotton ...	2 4 0	1 8 0	Do
IV.	All Kharif crops not specified above ...	1 10 8	1 0 0	Do
	II.—Branches of the Ganges, Lower Ganges, and Agra Canals.			
I.	Sugarcane and rice ...	6 10 8	3 5 4	Year.
II.	Tobacco, opium, vegetables, orchards, and water-nuts ...	4 0 0	2 0 0	Crop.
III.	All Rabi crops, indigo, and cotton ...	3 0 0	1 8 0	Do.
IV.	All Kharif crops not specified above ...	2 0 0	1 0 0	Do.
	III.—Dun Canals.			
	(1) *Bijapur Canal.*			
II.	Sugarcane ...	5 0 0	...	Year.
II.	Garden produce. first class rice, tobacco, opium, and'water-nuts ...	3 0 0	...	Crop.
III.	Indigo and cotton ...	2 4 0	...	Do.
IV.	Second class rice, wheat, oats, and all other inferior crops ...	1 4 0	...	Do.
	(2) *Rajpur, Katta Pathar, and Kalanjar Canals.*			
I.	Sugarcane ...	5 0 0	...	Year;
II.	Garden produce, first class rice, tobacco, opium and water-nuts ...	3 0 0	...	Crop.
III.	Indigo and cotton ...	2 4 0	...	Do.
IV.	Second class rice, wheat, oats and all other inferior crops ...	0 12 0	...	Do.
	(3) *Jakhan Canal.*			
I.	Sugarcane ...	5 0 0	...	Year.
II. & III.	Garden produce, firat-class rice, tobocco, opium water-nuts, indigo and cotton ...	2 4 0	...	Crop.
IV.	Second class rice, wheat, oats, and all other inferior crops ...	0 12 0	...	Do.
	Rate for tea on all Canals ...	0 12 0	...	Each watering.
	IV.—Rohilkhand Canals.			
	1. All lands irrigated from Government channels drawing their supply from the following rivers :— Baraur, Paha, Beni, Kichha, Dhora, Garhi, East Bahgul (above the Bareilly and Pilibhit road). Absara, Kailas, Khalwa, Dhorania (above the Kirni dam) Nala Escape will be charged the following water-rates per acre :—			
I.	Sugarcane, gardens, and orchards ...	2 8 0	1 10 0	Year.
II.	Early rice, tobacco, opium, vegetables, melons, and water-nuts ...	2 4 0	1 8 0	Crop.
III.	Late rice. Rabi and other crops not specified above ...	0 12 0	0 8 0	Do.
	2. All land irrigated from the undermentioned rivers :— Baraur, Paha, Beni, Kichha, Dhora, Sanka, Dhorania, Nakatia (*a*), East Bahgul (*b*), Absara (*d*), Kailas, Khalwa, Nala Escape, Garhi, Gora, East Kanda, Bamarsi (a tributary of the Pangaili) through the agency of works constructed and maintained by the State are charged the following water-rates per acre from 1st November 1878 :—			
I.	Sugarcane, gardens, and orchards ...	0 12 0	0 8 0	Year.
II.	Tobacco, opium, vegetables, melons, and water-nuts ...	0 12 0	0 8 0	Crop.
III.	All other crops. ...	0 6 0	0 4 0	Do.
	V.—Bijnaur Canals.			
I.	Fruit gardens or nursery gardens ...	5 0 0	4 0 0	Year.
II.	Vegetables, gardens, indigo, sugarcane, tobacco, water-nuts, cultivated grasses, ajwain, &c. ...	2 0 0	1 8 0	Crop.
III.	Rice, cotton, wheat, oats, barley, and all other pulses ...	1 0 0	0 12 0	Do.
	VI.—Bundelkhand Irrigation Works.			
I.	Sugarcane ...	3 5 6	1 10 9	Year.
II.	Rice, tobacco, opium, vegetables, gardens, and water-nuts ...	2 4 0	1 2 0	Crop.
III.	All Rabi crops ...	1 11 0	0 13 6	Do.
IV.	All Kharif crops not specified above ...	1 2 0	0 9 0	Do.

(*a*). Not below the northern boundary of pargana Karor.
(*b*). " the Garem dam.
(*d*). " the Canal escape at Beharipur.

No. 5885 S., dated 16th August 1881.

From—F. C. Channing, Esquire, Settlement Secretary to Financial Commissioner, Punjab,
To—The Joint-Secretary to Government, Punjab, Public Works Department, Irrigation Branch.

I am directed to forward a copy of a letter received from the Settlement Commissioner, No. 219 of 27th July, with the maps therein referred to, in original, for your information, and to suggest that, if you think fit, it might be usefully communicated to the officers employed on the Sirhind Canal.

No. 219, dated 27th July 1881.

From—Major E. G. Wace, Settlement Commissioner, Punjab,
To—The Settlement Secretary to Financial Commissioner, Punjab.

I venture to hope that I shall not be regarded as going outside the proper sphere of my duties in addressing to the Financial Commissioner the following representation concerning the manner in which the opening of the Sirhind Canal is likely to affect the agricultural system of the Jagraon Tahsil in Ludhiana, and the Moga Tahsil in Ferozepore. The latter Tahsil I have never visited, but its agricultural system is probably the same as that of Jagraon.. My remarks also probably apply to the villages of the Sikh States which adjoin the Ludhiana and Ferozepore Districts, and which will be watered by the Canal.

2. The degree in which the Canal will benefit these tracts depends very much on our introducing irrigation in such a way as will harmonize (1) with the manner in which the lands have been divided by the village owners, and (2, with the pre-existing system of dry cultivation. As regards the Bari Doab Canal, there is a feeling both among our officers and among the agriculturists that Cannl irrigation has not always been an unmixed advantage, and that it has not unfrequently led to a reduction of the productive powers of the soil. And the officers of that Canal have recently spent great pains in so arranging the irrigation as to secure the fair division of the water among the irrigators. These circumstances lead me to hope that the Irrigation Department will welcome any information on the agriculture and tenures of the Upper Sirhind Doab, which will aid them in distributing their water from the first on a system well adapted to the local agriculture and tenures.

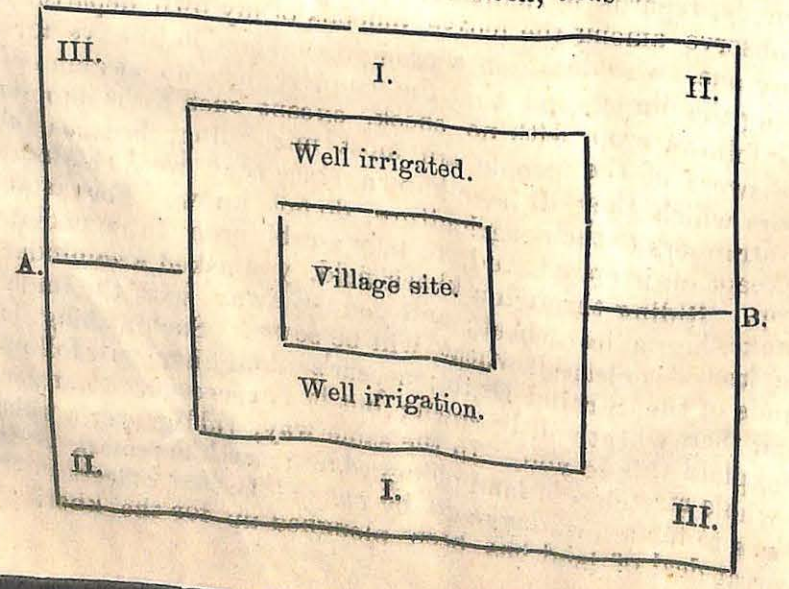
3. The tracts which the Sirhind Canal will water are cultivated almost entirely by Jats, usually of the Sikh persuasion. The great majority of the villages are cultivated by the owners themselves, and I wish to draw attention to the system on which their lands are usually divided. Our Settlement maps do not always show this; and (owing to an idea that it is no use expecting an officer to understand such matters) the answers both of the lambardars and of the patwari are frequently misleading. In reply to a question, how the lands have been divided, they will usually answer "*khetbat*," but a little patience will elicit the fact that the primary, and even the secondary division has been made by blocks, each patti having taken one, two, or three compact blocks; and it is only inside these blocks that the holdings are *khetbat*.

4. Then as regards agriculture, speaking from personal experience, and from what I observe among the native officials of my own department, it is most difficult for any one, who does not thoroughly understand native agriculturists to avoid gathering the impression that the country has no system of agriculture, and that crop follows crop with no check, except such as is supplied by short rain. The answers of the people are most misleading, because they take for granted matters which they all have known since they were children, but which we, who are strangers to their agriculture, do not know. For instance, it is impracticable, except on irrigated land, to take a rabi crop in immediate succession to a kharif crop. Riding through a kharif field, you asked a zamindar what crop he will take next, he replies wheat; and you go away with the impression that, as soon as the kharif is cleared, wheat will be sown. Such a thing is impossible in the dry lands of the Sirhind Doab; a year's ploughing will follow the kharif harvesting, and then wheat will be sown; but it never occurs to any agriculturist that he need explain this to you. In the same way, riding over a village in April you will find whole stretches of land ploughed up; and the remark is immediately made (as it was to me a few days ago by one of the best officers in the Commission) that a great deal of land has been ploughed up for the kharif; but if you

ask an agriculturist he will tell you he is ploughing, not for the kharif, but for wheat which he will sow next September. The kharif (cotton excepted) is always sown, on the land from which, in May, the rabi is reaped. If this discovery is followed by the remark that in this case the land bears two crops in a year, the agriculturist will at once vociferate that the thing is impossible, and that rain land only bears one crop a year. But the contradiction arises from the agriculturist not understanding what you mean. The year used by these agriculturists is the Hindi Sambat, which ends just before the wheat ripens. When you tell an agriculturist that his rain land bears two crops in the year, what he understands you to mean is that he can sow a kharif at the beginning of the new Sambat, and follow it in the same Sambat with a rabi, which is utterly impossible. On the other hand, it is quite true that he always takes two crops in 12 months, following them with a year's fallow. The whole rain land of the middle Sirhind Doab (that is to say, the land that lies near the middle course of the Canal, neither at its head nor at its tail) is cultivated on the system shown by the following diagram. Let me assume a holding consisting of two fields or blocks, A and B, owned and cultivated by the same person : the course of cultivation will be—

Year A. D.	Harvest.	Field A.	Field B.
1880	Rabi Kharif	Crop Crop	Fallow ploughing.
1881	Rabi Kharif	Fallow ploughing	Crop. Crop.
1882	Rabi Kharif	Crop Crop	Fallow ploughing.
1883	Rabi Kharif	Fallow ploughing	Crop. Crop.
	And	so on	

5. Any officer who will by his personal inquiries and observation verify the above remarks, will shortly come to see that there is in the country of which I am writing an agricultural system peculiarly favorable to the economical distribution of water. As he rides from village to village, or obtains a bird's-eye view from such high points as the old palace at Sahna, he will see that the lands under crop and those under fallow lie in large separate blocks. And then, if he will refer back to a field map in which the lands of each patti are properly marked off, he will see that the division of the village among the several pattis of owners has been arranged with direct reference to the agricultural course that I have described. The commonest and simplest instance of this is a case in which the village is for purposes of cropping divided into two parts ; and its ownership being divided into three pattis each patti has a share in each agricultural block, thus—



In this skeleton plan, the line A B marks the division of the village for the purposes of agriculture ; when the unirrigated land north of A B is under crops, that south of A B will be in fallow. It will be observed that each of the pattis I, II, and III., has an equal share in either block. I have put the case in its simplest form ; but the existence of a system substantially of this nature will be apparent to any officer who will be at the pains to compare the cultivation of a few villages with the (pattis) divisions on which the village ownership has been primarily divided.

6. I come now to the main question with a view to which I have written this letter, *viz.*, how will our introduction of Canal water affect this dry system of agriculture ? I assume that the principle of restricting the water supplied to any village to the quantity sufficient to irrigate a third of its land will be strictly adhered to on the Sirhind Canal. I do not know what the exact rule is to be, but I believe that there will be a rule of this nature. The first point that arises is, are we going to give the water in a way which will work into this two-year system (one year crop and one year fallow)? It is not practicable to answer this question, except in personal communication with each village concerned. But we may, I think, say with certainty that an officer who understands the system by which under this two-year course, the entire crops of a village are changed over annually from one side of the village to another, and the way in which the entire partition of ownership is based on this system, will be likely to find a very different answer to this question to the answer which would be supplied an officer who comes new to these villages, and to whom the village system has not been explained.

7. Most Canal Officers of standing have seen great fluctuations of opinion among the zamindars as to the value of Canal-water. It is a common thing for the zamindars at first to look askance on the water offered them, then to apply it too frequently, and, finally, to complain that the water has weakened their land. An officer who has passed through such an experience, and who also has before him the rule of his Department limiting the water-supply to one-third of each village's land, would, I think, probably do all in his power so to introduce the Canal water as not to disturb, but to fall in with the existing two-year course of agriculture. What can be better than that the water should be given in one year to one side of the village, and in another year to the other ? Under such a system, each irrigated field will get a year's fallow. But, if you mark out your irrigating channels so as to irrigate only a defined one-fourth of the village, complaints of exhaustion of this land are sure to follow.

8. Obviously a crop raised by irrigation takes more out of the land than a crop raised by a scanty rainfall. With a scanty rainfall the agriculturists universally follow a year's crop with a year's fallow. The first crops raised by irrigation will be very fine. This is likely to tempt the agriculturists to alter their system in the direction of shortening the fallows. If Canal irrigation is so applied as to favor this, then nothing but manuring can save the land from deterioration; and the supply of manure in the country is very small.

9. I will not further lengthen this letter. My object in writing it is, not to suggest solutions of these matters to the Canal Officers, but to draw attention to the leading features of the present agriculture of the Sirhind Doab, and to urge the great advantage that will result if this system is properly understood by the officers to whom the task of developing the irrigation of the Canal is entrusted. I have some reason for saying that the subject has hitherto been very little understood. At the same time I shall not, I hope, be understood as meaning that the system described in paragraph 4 prevails everywhere. Until recently I had very little idea how largely it does prevail. But it would be easy to point out lands cultivated on a different system. For instance, in the low sandy lands north of Jagraon, known as the Lower Dhaia, rabi grain crops are sown successively every year, and there are no kharif crops. Similarly, as you travel south-west towards Sirsa and approach the tail of the Canal, you find the decreasing rainfall renders the two-year system impracticable, and in lieu thereof only rabi may be grown ; or where the rainfall is very small, the zemindars sow rabi or kharif as they have the chance.

10. My whole letter may be summed up in this one sentence—that every officer entrusted with the task of introducing Canal-water into a village should be

made to understand that before he does anything else he must first get a clear idea of the system on which the lands have hitherto been cultivated, and of the bounds of the principal pattis or other divisions of ownership. Until he knows these things he will neithter understand the villagers, nor will they understand him; he will be working in the dark so far as any real knowledge of the effect of irrigation on the village is concerned; and when disputes arise concerning the distribution of the water, he will be unable to see their real merits. The common statements to the effect that the fields are *khetbai*, and that every one cultivates whatever crops he likes, and where he likes, are in nine cases out of ten due to ignorance, and ought always to be received with distrust.

11. I enclose two copies of the field maps of two villages of the Ludhiana district, furnished to me by the Settlement Officer, Ludhiana, showing the division into pattis above commented on by me, and also illustrating somewhat imperfectly the agricultural course.

No. 209S./924b, dated 5th August 1882.

From—H. C. Fanshawe, Esquire, Under Secretary to Government, Punjab, Revenue Department,
To—The Senior Secretary to Financial Commissioner, Punjab.

In reply to your No. 388 of 17th April last, I am directed to state that the Hon'ble the Lieutenant-Governor agrees generally with the views expressed by Mr. Lyall as to method of distributing water from the Sirhind Canal, and the rates which should be charged for the use of water; but that, before expressing a final view on the questions raised, His Honor would be glad to receive the opinions of the Settlement Commissioner and the Settlement Officer of Ludhiana, to whom the correspondence in the case has been referred by the Financial Commissioner.

2. The Lieutenant-Governor will also be glad to receive the expression of Mr. Lyall's opinion on two points in the correspondence which have not been specially noticed. The first of these is the proposal made by General Gulliver, in paragraph 7 of his note of the 13th January, and which is apparently accepted by Colonel Home in paragraph 24 of his memorandum that an officer of Settlement experience should be at first associated with the Canal officers, in arranging for the distribution of the water from the Canal. This plan appears to the Lieutenant-Governor to be a good one as a temporary arrangement on first starting, and His Honor would be glad to learn the opinions of Mr. Lyall and Major Wace on the subject. The second point is the suggestion of General Gulliver (paragraph 18 of his minute) that newly irrigated lands should be charged at half rates only for the first two years, as on the Agra Canal. It has been ascertained from Colonel Home that he has no objection to this proposal if it is considered likely that it will encourage the rapid spread of irrigation; but it has also been pointed out that the conditions of the two Canals are somewhat different, inasmuch as the villagers had to construct long water-courses for themselves on the Agra Canal, whereas on the Sirhind Canal this will be done by Government. On this subject, therefore, also the Lieutenant-Governor would wish to receive an expression of opinion by the Financial Commissioner and Settlement Commissioner.

3. The only proposal made by Colonel Home as to which Sir Charles Aitchison feels doubtful is the recommendation (paragraph 26) that a double rate should be levied on fallow lands watered once only if sown after ploughing. This does not appear to be the case on other Canals; and as the entire charge for kharif crops is only Rs. 2-10-0 per acre, and far rabi crops Rs. 3-12-0, it seems to the Lieutenant-Governor that little will be gained by charging a double rate in the case proposed. But on this point, as on the others above detailed, His Honor will be glad to receive Mr. Lyall's opinion.

4. For facility of reference the papers forwarded with your letter under reply are returned herewith, and it is requested that they may be re-submitted with the expression of Mr. Lyall's views. I am to ask that these may be furnished by the earliest date possible, as before the rates proposed are finally approved it will probably be necessary to make a reference in connection with them to the signatory states of the Sirhind Canal.

No. 69/1161, dated Lahore, 28th September 1882.

From—C. L. Tupper, Esquire, Junior Secretary to Government, Punjab,
To—The Joint-Secretary to Government, Punjab, Public Works Department, Irrigation Branch.

The accompanying correspondence* regarding (1) the water-rates to be charged on the Sirhind Canal, and (2) the method of distributing the Canal water, is forwarded for the information of the Irrigation Branch of the Public Works Department.

* From Secretary to Financial Commissioner, No. 388, dated 17th April 1882.
Reply, No. 209S., dated 5th August 1882.

2. It will be observed that the Lieutenant-Governor in this Department awaits reports from the Financial Commissioner, the Settlement Commissioner, and the Settlement Officers of the Sirsa and Ludhiana districts, on certain questions connected with the proposed water-rates. It is, however, understood that a very early decision is urgently needed upon the other branch of the case, *viz.*, the system recommended for the distribution of the water. Whatever plan is adopted must, if it involves any modification of the rules under the Canal Act, be submitted for sanction to the Government of India, and it is necessary that the Canal subordinates shall be fully instructed in the work before them during the forthcoming cold season, the irrigation on any extended scale commencing from next spring.

3. In these circumstances, the Lieutenant-Governor will at once record his views upon so much of Colonel Home's note of the 30th March 1882, as relates to the subject of distribution.

4. The general plan of bringing the water, at the public expense, near the fields, by the construction of *minors* or small carrying channels, to be filled according to turns of a certain number of days' duration, was approved by Sir Robert Egerton, and is supported by the Financial Commissioner. In Sir Charles Aitchison's opinion the system is a good one. It gives complete control over the water-supply, reduces the interference of Canal underlings, and affords facilities for quick irrigation.

5. The principle of dealing with each village as a whole, instead of with individual irrigators, is entirely approved. The suggestion that an officer with settlement experience shall be associated with the Canal Officers in effecting the original distribution of water, is also accepted. Although the internal distribution of the water within the village would be left to the villagers themselves, yet the Civil Officer, associated as above in the work, should himself, and by means of the agency at his disposal, help the people to arrive at a fair allotment of shares and turns within the village, should decide disputes and should frame a record for each village stating clearly the arrangements made.

6. The Lieutenant-Governor concurs in the proposals made in paragraph 20 of Colonel Home's note on the subject of distribution from British branches passing entirely through the lands of a Native Chief. In the absence of any objection on the part of the Native State concerned, the British system should be introduced, and, when it has been well established, the Chief should be invited to contract for the supply.

7. The rules for limiting the irrigation to a certain proportion of the village area, suggested in paragraphs 21 and 22 of the note, should not be worked too rigidly, especially at first starting; and the reasons for restricting the supply of water should be fully explained to the people. It should suffice if, on an average of several harvests, the limit of area prescribed for a village is found to be observed. It would not be advisable that such limit should be strictly adhered to at every harvest without discretion to the Canal Officer to vary it in case of need. A register should be kept up for each village showing the prescribed area for irrigation and the area actually irrigated at each harvest in each year. The inspection of such a record would at once show whether the supply was, on the whole, duly regulated.

8. To the recommendation, however, that the use of Canal water on well land should be prohibited, and the prohibition enforced by penalties under the Act, the Lieutenant-Governor is unable to agree. Well land should be excluded from the calculation in determining the area to be irrigated; and it would doubt-

less be wise where water was fairly near the surface to discourage the supply of Canal water to lands protected by wells. To go further would be to infringe the principle of permitting the villagers to distribute the water within the village for themselves; and interference might be really contrary to the permanent interests of the country where the water level was so far below the surface that there would be great economic advantage in substituting Canal for well irrigation. If any check is necessary, it should be applied to the village as a whole, and irrigation from the Canal be refused to a community whose lands were already abundantly protected by wells or, partly from this cause and partly from steadiness of rainfall, might be regarded as generally secure from drought.

9. Subject to the above remarks, the Lieutenant-Governor accepts Colonel Home's proposals in regard to the distribution of water.

No. $\frac{70}{1162}$, dated Lahore, 28th September 1882.

Copy forwarded to Secretary to Financial Commissioner, Punjab, for information, in continuation of No. 209, dated 5th August 1882.

No. 4020 I., dated Lahore, 14th November 1882.

From—Lieut.-Colonel R. Home, R. E., Joint-Secretary to Government, Punjab, P. W. Dept., Irrigation Branch.

To—The Junior Secretary to Government, Punjab.

I am to acknowledge receipt of your No. 69, dated 28th September 1882, and to forward a copy of Government of India No. 412 I., dated 1st November 1882, conveying sanction to the scheme of distribution proposed for the Sirhind Canal.

2. With reference to His Honor's remarks conveyed in paragraphs 5, 7 and 8 of your letter under reply, I would state that the association of a Civil officer with the Canal establishment in effecting the original distribution of water was not recommended in Lieutenant-Colonel Home's note, as he had doubts whether there was an absolute necessity for the deputation of a Civil officer for that purpose. Colonel Home is still of the same opinion, and would suggest that the instructions should be optional, and that the assistance should be given on application from the Superintending Engineer, who would be instructed to apply for help in all cases where local circumstances or a deficiency of trained Canal establishment, rendered such help necessary.

3. With reference to paragraph 7, which conveys orders regarding the restriction of area in individual villages, Lieutenant-Colonel Home would remark that he proposed regulating the size of the outlets for the supply of water to each village, so that on the basis of a fair duty per cubic foot of discharge the proportion of area mentioned in his note would be watered. By using a proper economy doubtless a considerably larger area might be irrigated, but this again would depend in a great measure on the class of crops raised, the supply given being leased on a proportion of crops of each class. The order was proposed to be a general one, the Superintending Engineer having the authority to vary the proportion according to the circumstances of the villages: for instance, if the area that remained after the deductions described in paragraph 22 of the Chief Engineer's note formed only a small proportion of the village lands, a much larger proportion (perhaps even amounting to the whole) of the balance than that prescribed in paragraph 21 would be assessed for the water-supply.

4. It will be understood from the above remarks that a maximum supply of water based on the principles above explained must be allotted to each village, and that once the minor distributary channels, the size of which will be based on the aggregate of areas to be watered by each minor, are made and the outlets of correct dimensions fixed, there will be no possibilty of adding to the allotment of water to any single village without altering the dimensions of the minor, and possibly also of the main distributary channel. A variation in maximum area would thus appear to be possible only in the case of some of the villages

on a minor not utilizing their full allowance, as this would leave a larger supply available for the remaining villages which drew their supply from the same minor. A register of area watered in each village forms part of the returns prepared in this Department, and from the records prepared for the purposes of the original distribution, a constant check on the proportion of area watered in each village will be obtainable; but Lieutenant-Colonel Home is of opinion that, except in the manner above described, any arrangement for an optional increase in irrigated area of a village will not be possible.

5. With reference to the orders conveyed in paragraph 8, on the subject of giving Canal water to lands which have already been assessed to land revenue as watered from wells, Lieutenant-Colonel Home would point out that if a unified water rate is sanctioned, the proposals in his note would be unnecessary; but if the rate is divided into owner's and occupier's rates as on other permanent Canals in this Province, the watering of well lands will be a clear loss of revenue, as the Canal will only receive a book credit, instead of a cash payment, for so much of the water-rate as is assessed at owner's or water-advantage rate on such lands: and this was the reason for the strong measures which were proposed both by General Gulliver and Lieutenant-Colonel Home for discouraging the irrigation of these particular parcels of land.

6. I am to request that any orders that His Honor may be pleased to issue on the above explanations may be forwarded at an early date, to enable Lieutenant-Colonel Home to issue instructions on these matters to the Superintending Engineer, Sirhind Canal.

No. 412, I., dated 1st November 1882.

From—The Under Secretary to the Government of India, Public Works Department.

To—The Secretary to Government, Punjab, Public Works Department.

In reply to your letter No. 01269 I., of the 9th October, I am directed to communicate the approval of the Government of India of the system of distribution of the water from the Sirhind Canal, proposed by the Chief Engineer for Irrigation in his note forwarded therewith.

No. $\frac{84}{1451}$, dated Lahore, 27th November 1882.

From—H. C. Fanshawe, Esquire, Offg. Junior Secretary to Government, Punjab,

To—The Joint-Secretary to Government, Punjab, Public Works Department, Irrigation Branch.

In reply to your letter No. 4020 I., of the 14th instant, I am directed to state that the Lieutenant Governor accepts the explanations which are offered in paragraphs 3 to 5, and has no further remarks to offer concerning them. With reference, however, to the proposed deputation of a Civil officer with settlement experience to assist in effecting the first distribution of the water, His Honor will reserve his decision until a reply has been received from the Financial Commissioner to the letter of this Government No. 209 S. of 5th August last, to which a very early answer has been to-day invited.

No. $\frac{85}{1452}$, dated Lahore, 27th November 1882.

From—H. C. Fanshawe, Esquire, Offg. Junior Secretary to Government, Punjab.

To—The Senior Secretary to Financial Commissioner, Punjab.

No. 4020 I., dated 14th November 1882, from Secretary to Government, Punjab, Public Works Department, Irrigation Branch, and enclosure.

This office reply, No. 84, dated 27th November 1882.

In continuation of my letter No. 209 S., of 5th August last, I am directed to forward for the information of the Financial Commissioner, copies of the letters marginally noted, and to say that the Lieutenant-Governor would be very glad to receive by an early date, the expression of Mr. Lyall's views on

the questions raised in the above letter, and in Mr. Tupper's memorandum of 28th September 1882, of which a copy was forwarded to you under the endorsment of this office No. 70 of 28th September 1882.

No. 1267, dated Lahore, 5th December 1882.

From—F. C. CHANNING, Esquire, Senior Secretary to Financial Commissioner, Punjab,

To—The Offg. Junior Secretary to Government, Punjab.

Replies to reference on subject of rates to be levied on the Sirhind Cacal.

IN paragraph 6 of my letter No. 338 of 17th April, I stated that Mr. Lyall was sending a copy of the correspondence with your office, on the subject of the water-rates to be levied on the Sirhind Canal, to Major Wace, for communication to the Settlement officers of Ludhiana and Sirsa, and was inviting an expression of those officers' opinions, and on receipt of your No. 209 S., of 5th August, a copy of that letter was also forwarded to Major Wace. I am now directed to acknowledge the receipt of your subsequent communication No. 70, of 25th September, and to submit, in original, a letter from the Settlement Commissioner No. 245, of 2nd September, with its enclosuros.

Remarks on some points connected with the distribution of the water.

2. Mr. Lyall agrees generally in the views expressed in paragraph 3 of Major Wace's letter, but does not think that they clash with Colonel Home's system of distribution; if this is properly understood, he agrees also in the remarks contained in Major Wace's paragraph 4, on the proposal to prohibit the application of Canal-water to lands irrigated from wells; but with reference to Major Wace's remark at the end of that paragraph, that the Revenue authorities should, where well land is watered from the Canal, allow the Canal authorities credit for the water assessment previously paid by the wells, I am to point out that it would be the remitted owner's rate, if any, and not the land revenue assessment on wells for which the revenue authorities would give the Canal credit in account.

Remarks on rates proposed by Colonel Home, with reference to amendments suggested by Major Wace and Mr. Walker.

3. As to the Canal charges proposed by Mr. Walker and Major Wace (for which see Mr. Walker's memo. and paragraphs 8 to 13 of Major Wace's letter), I am to remark that Mr. Lyall in paragraph 3 of my No. 388 of 17th April last, recommended that the rates suggested by Colonel Home should be tried; but now after considering all that Major Wace and Mr. Walker have written on the subject, Mr. Lyall is disposed to think that Colonel Home's proposed rates on sugarcane and on maize, tobacco, opium and vegetables are perhaps open to the charge which Major Wace brings against them of encroaching on the returns due to industry and manure. It may be remembered also that the Government of India lately asked if something could not be done to encourage the growth of sugarcane, and as to the rates proposed by Colonel Home for orchards and gardens, Mr. Lyall thinks that they may perhaps be said to be open to Major Wace's charge of overlooking the Government's desire to encourage arboriculture, in a country now bare of trees and gardens. For these reasons the Financial Commissioner thinks that some reduction of the rates proposed by Colonel Home for Classes I. and II. is probably desirable; and though the reasons do not apply equally to rice or water-nuts in Class I., it is probable that these will be grown in this tract little, if at all, and the rate for sugarcane, even when reduced, will be high enough for them: the same remark, *mutatis mutandis*, applies to the case of indigo in Class II. If then the rate for Class II. is reduced, a little, cotton which is likely to be an important crop should, Mr. Lyall thinks, be included in it. Again Major Wace and Mr. Walker seem to show that the rates for rabi crops might with advantage be a little lowered, and those for unspecified kharif crops a little raised. The rate for a single watering taken for ploughing fallow only, should, Mr. Lyall thinks, be very low so as to encourage fallowing and working up of the land. Generally also Mr. Lyall agrees with Major Wace and Mr. Walker that, if possible, the rates to be used should be such as will adjust themselves without fractions to the local bigha and ghumao of the country; this measure will, he believes, be a real benefit to the people.

Rates suggested by the Financial Commsisioner.

4. The rates then for flow irrigation which, with reference to these considerations, Mr. Lyall ventures to suggest for consideration by Colonel Home and the Government, are as follows :—

Class.	Crops.	Rate per acre.			Rate per Ludhiana bigha.		
		Rs.	A.	P.	Rs.	A.	P.
I.	Sugarcane, rice, water-nuts	6	12	0	1	6	6
II.	Gardens, orchards, tobacco, opium, vegetables, indigo, maize, cotton	3	14	2	0	13	0
III.	All rabi crops	3	4	8	0	11	0
IV.	All kharif crops not specified above	2	11	2	0	9	0
V.	A single watering for ploughing fallow	0	12	0	0	2	6
VI.	A single watering for ploughing to sow	1	8	0	0	5	0

Mr. Lyall thinks that Colonel Home is right in proposing to take for a single watering to sow, double the rate levied for a single watering to plough fallow: it is certainly, he thinks advisable, to encourage by a specially favorable rate the ploughing of fallow, and the same land will also probably pay again when it is sown. The same argument does not apply in the other case, and Mr. Lyall can understand that there must be practical reasons for not wishing to encourage people to take or pretend to take one watering only for a crop. In his remarks in paragraph 11, on "fallow waterings" Major Wace seems to the Financial Commissioner to overlook the distinction between a single watering for ploughing fallow and a single watering for ploughing land for sowing.

Remarks on these rates.

5. Mr. Lyall prefers the rates, which he has suggested above, to those suggested by Major Wace; they are slight modifications of Colonel Home's rates, generally a little lower on the more important crops, and therefore Mr. Lyall thinks a little safer. Major Wace's proposed rates are still lower, but the Financial Commissioner does not see that this is necessary: they are exceedingly few and simple, but Mr. Lyall is inclined to think that Major Wace has sacrificed too much in order to get few and simple rates.

Remarks on the question as to the from which should be taken by the rates, end on the question of levying a separate owner's rate.

6. The Financial Commissioner does not agree with the opinion expressed by Major Wace in his paragraph 14 on the question of charging an owner's rate, and it will be observed that the Settlement Officers consulted also differ from him. Mr. Lyall has stated his reasons for holding the opposite opinion in the case of new Canals in the note referred to in paragraph 3 of my No 338 of 17th April last. There are also some special reasons in the case of the present Canal for at all events commencing with a high occupier's rate only; this course, if adopted, will simplify the decision of the question of the rate to be paid by land of non-signatory States taking water. The Financial Commissioner wishes to explain, however that his idea was and is (1st)—that with high occupier's rates it will probably not be necessary or advisable to demand owner's rate in any form for at least ten or fifteen years after the Canal opens, and that until the necessity arises, the question how the owner's rate should be levied may be left open; and (2ndly), that if after some years in spite of the high occupier's rates the increase of rent of Canal irrigated land due to Canal irrigation is found to be large enough to make it worth while for Government to claim half, then Mr. Lyall's idea is not that the demand should be assessed by a Settlement Officer as a fixed sum on the village or field, (which is what he believes was intended by Mr. C. J. Lyall, and is contemplated in the North-Western Provinces), but that it should be assessed for villages or groups of villages or for certain tracts according to soil in the shape of a Canal rate demandable only for the harvest for

which water is taken. This explanation meets, Mr. Lyall thinks, Major Wace's objection in the first part of his paragraph 14. The water advantage rate of the Bari Doab Canal is an owner's rate assessed in this way by the Settlement Officer for each assessment circle; it is, however, not well assessed. As to Major Wace's argument that the separate rate is advisable in the interest of the tenants, Mr. Lyall thinks that it is necessary in the interest of some occupancy tenants in old Canal irrigated tracts, as he has explained in paragraph 4 of the note above referred to; and he believes that the owner's rate was invented for the protection of such tenants in the North-Western Provinces, but he feels confident that the system is not wanted for the safety of any occupancy tenants in the tract, which this new Canal will irrigate, and as to tenants-at-will Mr. Lyall's experience on the Upper Sutlej Inundation Canals and elsewhere, and also the facts stated as regards the Agra Canal, convince him that the tenant-at-will and the proprietor will decide for themselves the qustion of who is to pay the total Canal demand or any part of it with little or no regard to any division of it or any general rule of liability which the Government may make.

Proposes favourable rates for first two years after water is available.

7. With reference to Major Wace's paragraph 15, Mr. Lyall thinks that the privilege of half rates might be allowed for the first two years *after water is first offered to a village*, not after it is first taken, if taken later. The object of the concession is to induce the people to give the water a trial as soon as possible.

Discusses the question of the deputation of a Settlement Officer to assist the Canal Officers in the work of distribution.

8. On the subject of the proposed deputation of a Settlement officer to assist in the distribution of water, which is discussed in Major Wace's paragraph 16, I am to state that Mr. Lyall has consulted Colonel Home and finds that he and the Superintending Engineer are both of opinion that the appointment of a Settlement Officer for this duty is unnecessary, and that the Canal Officers will be able to do the work without such assistance. They think that the bringing of the minors to the villages, and the fixing the amount of water to be given, is work in which the Settlement Officer could not help, or in which his help is not necessary. As to the village "*hissa-kashi*" or internal distribution of shares in water, they think that the people of each village will settle this in the course of two or three years among themselves, if the principle of all owners of irrigable land having a right to a proportionate share of water is declared, and, when necessary, enforced: and after two or three years, when a settlement has been worked out, they think that they can record it. The Financial Commissioner thinks that these views are perhaps right, at any rate he is not at all prepared to recommend a Settlement Officer being sent, if the Canal Officers do not ask for him, and they agree to ask for him, if they find that they want him. If a Settlement Officer is sent, he should, Mr. Lyall thinks, go as an Assistant to the Superintending Engineer, and work for the time as an officer of the Canal department. The Financial Commissioner is not sure that if Mr. Walker could be spared at the time, he ought not in any case to be deputed to accompany Major Weston as an adviser for a month or two, when the work of devising minors and negotiating with the village is first commenced: or perhaps a selected Settlement Superintendent might be deputed on the reliance of his being useful.

Question of creation of a separate body of Canal patwaris discussed.

9. In his paragraph 17, Major Wace deprecates the creation of a separate body of Canal patwaris, but Mr Lyall believes that he has, to some extent, changed his mind since he wrote this paragraph, on its being explained to him that the Canal Officers hope to make one man do the duty of Canal patrol and canal patwari. Mr. Lyall's own view is that it would not be possible for the district patwaris to do the work of Canal amins, and also to properly perform their own duties.

Index to Settlement Commissioner's letter No. 245, dated 2nd September 1882, to Senior Secretary to Financial Commissioner.

No. of para.	Subject.
1	Replies to proposals concerning distribution of water and rates of assessment on Sirhind Canal.
2	Method of irrigation proposed by Colonel Home will be appreciated by the people.
3	Rules for limiting amount of water to be allotted to each village not to be too rigid. English register to be kept up for each village for purposes of water distribution.
4	Proposal to prohibit the application of Canal-water to lands irrigated from wells.
5	Method of assessment proposed by Mr. Wilson, paras. 5—12 of his note.
6	Proposals for Canal assessments first made by Settlement Commissioner in October 1881, and Mr. Walker's comments considered. Land should be assessed according to the course of husbandry followed.
7	Manured lands are distinguishable from those which are not.
8	Contract system of assessment practicable in respect of manured lands.
9	Mr. Walker's rates compared with Colonel Home's.
10	Crop details of existing irrigation on the Bari Doab and Western Jumna Canals.
11	Rates for assessments recommended by Settlement Commissioner.
12	Further explanation of rates.
13	Abstract of rates recommended by Settlement Commissioner.
14	Maintenance or otherwise of owner's rate.
15	Half rates on irrigated lands for first two years.
16	Proposed deputation of a Settlement Officer, during first two years of Canal working.
17	Deprecates the creation of a separate body of Canal patwaris.
	Enclosures.
i	Seven tables of crop details referred to in para. 10.
ii	Copy of paras. 1—8 and 14—16, with draft rules, of Settlement Commissioner's No. 1088, dated 12th October 1881, to Superintending Engineer, Sirhind Canal.
iii	Original notes by Mr. Walker and Mr. Wilson.

No. 245, dated Kasauli, 2nd September 1882.

From—Major E. G. Wace, Settlement Commissioner, Punjab.

To—The Senior Secretary to Financial Commissioner, Punjab.

Replies to proposals concerning distribution of water and rates of assessment on Sirhind Canal.

I have the honor to reply to your No. 2,767, dated 17th April 1882 and the Punjab Government's No. 209S., dated 5th August 1882, on the subject of the method of distributing water from the Sirhind Canal, and the method and rates of the Canal assessments. I forward herewith a copy of paragraphs 1—8 and 14—16 of a letter No. 1088, dated 12th October last, addressedby me to the Superintending Engineer of the Sirhind Canal; also notes in original by Mr. Walker, Settlement Officer, Ludhiana, dated 20th June 1882, and by Mr. Wilson, Settlement Officer of Sirsa, dated 29th May 1882.

Method of Irrigation proposed by Colonel Home will be appreciated by the people.

2. As regards the method of irrigation proposed in Colonel Home's memorandum of 30th March 1882, I apprehend that my opinion is not asked; nor do I see my way to saying much on this subject. But I am very glad to see that there will be real effort to deal with villages as a whole and not with individual irrigators; and so far as I understand what Colonel Home wishes to attempt, I think his plan is likely to be very much appreciated by the irrigators. I venture, however, to point out with reference to paragraph 15 of Colonel Home's memorandum, that the irrigating seasons (rabi and kharif) overlap each other in respect of some crops; *e. g.*, sugarcane, cotton, melons, tobacco; and that, to take the broadest instance of the kind, if a village were asked at the end of the kharif (in September) to say what it would irrigate for the next rabi, the reply would necessarily be,

(*i*). that they had so many acres cotton and cane still requiring water,

(*ii*). that they would cultivate so many acres Rabi,

(*iii*). that they would need some water to prepare next year's cane fields.

I do not state this as any real stumbling-block in the way of Colonel Home's scheme, but only in order to point out that the Executive Canal Officers will not be able to work the scheme quite so simply as would be gathered from the first reading of it; and that the proper distribution of the water will still be a task calling for much skill and vigilance on their part.

* Rule for limiting amount of water to be alloted to each village not to be too rigid. English register to be kept up for each village for purposes of water distribution.

3. Then again, with reference to paragraphs 21 and 22 of Colonel Home's* memorandum, I think there is some danger, lest the rule restricting irrigation usually to $\frac{1}{5}$, $\frac{1}{4}$, or $\frac{1}{3}$ of a village should be made too rigid; especially at first starting. We can and should say plainly to every village from the first, that for many urgent reasons (which, if properly explained, the irrigators will appreciate as well as ourselves) we are deliberately laying out the whole system of distribution, so that the distributories shall not carry to any village more water than will usually irrigate $\frac{1}{3}$ or $\frac{1}{5}$ (according to the position of the village). But the proper place to apply the check is in the size of the distributories and in the gauges; and it can only be successfully applied by keeping in the office of the Divisional Executive Engineer an English register for each village, showing in the 1st place the calculation stated in paragraph 22 of Colonel Home's note, and in the 2nd place the area actually irrigated every harvest. If Colonel Home's calculation allows to any village 1,000 acres of irrigation, then this register will show at once in what harvest the limit was exceeded, or to what extent the water supplied was below the allowable limit. I do not know whether, under the existing rules of the Canal Department, any register of this nature is kept up; but if not, I would very strongly urge its adoption as indispensable, if we would secure in a sound form the restrictions on over-irrigation at which Government is aiming. The register should be faced with a map of the village on a small scale, showing how the village is served with water. I would also suggest that Executive Officers should not be require to enforce the limit too strictly. They should be told that the village register should show that on an average of harvests the limit is not exceeded; and that the distributing gauges are increased or decreased in size, as experience shows is necessary, in order to maintain this restriction; but subject to this general con-

* Compare paragraphs 5 and 6 of Mr. Walker's note herewith enclosed.

formance with the restrictions laid down by Government they should be encouraged to distribute the water beneficially with reference to the current necessities of each season. Unless a discretion of this nature is entrusted to the Executive Officers of the Canal, nay more, unless it is plainly required of them, the Canal will fail of doing much useful work; and the Government would be likely to receive in a short time representations both from its own Land Revenue Officers and from the signatory states to the effect that the water supply is not properly adapted to the varying requirements of different years.

Proposal to prohibit the application of Canal water to lands irrigated from wells.

See paragraph 2, of Mr. Wilson's note, and paragraph 4 of Mr. Walker's note.

4. In paragraph 22 of his note, Colonel Home also proposes to prohibit the application of canal-water to lands already irrigated from wells. Both Mr. Walker and Mr. Wilson take objection to this proposal. Mr. Walker states details of his recent assessments, which show the manner in which the proposed restriction would work in the Ludhiana district. I would submit for consideration, whether the proposal does not involve an attempt to enforce a sound principle in a wrong way. If a village is favourably situated for irrigation from wells, canal-water ought not usually to be allotted to it; that is to say, if a village has a fifth of its land already irrigated by 30 feet wells, the canal-water should be refused to it, being needed for villages which are not so advantaged. If, however, the wells are 50 or 60 feet deep and the area irrigated by them is small, I think it would be wrong to attempt by artificial restrictions to keep up a difficult and expensive form of irrigation after a very much easier and more profitable means of irrigation has been brought to the village at a great outlay on the part of Government. I apprehend that the restriction proposed by Colonel Home is prompted partly by Section 39 of the Canal Act, which forbids the assessment of owner's rates on land already assessed with land revenue at irrigated rates.

That is to say, if land before irrigated by wells is supplied with canal-water, the water will not yield to the Canal Department the same return, as will be yielded if it is supplied to other land. But it does seem to me right, to allow the question of the substitution of easy and profitable canal irrigation for laborious irrigation from wells to be decided on reasons of this kind. If irrigation from wells in any village is comparatively easy and extensive, the village should not be supplied with canal-water. If the wells are deep, the irrigation laborious, and the irrigated area small, canal-water should be supplied, if desired by the cultivators. And the land revenue authorities should accept the position, that in the altered circumstances of the country the cultivators cannot fairly be expected to go on working their wells, and should allow the Canal authorities credit for the water assessment previously paid by the wells.

Method of assessment proposed by Mr. Wilson, paras. 5—12 of his note.

5. The method of assessment contemplated by Mr. Wilson is one, which I do not think the Canal Officers will accept. It is briefly described in his paragraph 11. Its main features, are, (*i*) that different rates should be charged on different portions of the Canal, varying with the rain-fall; (*ii*) that eventually the rates should also vary from village to village according to other local advantages or diversities of soil; (*iii*) that the Canal Officer while making his own annual measurements and assessing on the crops, should state his demand for each village in a lump sum: and that the Collector would then call on each village to make its own *khewat* or distribution of this sum on holdings.

I think it would be very difficult to reduce to a practical form the first and second of these proposals. My experience of land assessment work is that we are continually being led into proposals, which can be supported with reference to certain admitted sound principles, but which cannot be put into practice because they have not taken account of other matters equally important. Of most assessment work, all that can be said is that we have tried to take a complete view of the whole subject, and have proposed the simplest solution that seemed open to us; and above all that we have not cut adrift too suddenly from past experience. Well applied corrections of a pre-existing system are usually much more valuable than extensive changes. Officers who are working on these principles, would be unlikely to take up Mr. Wilson's proposals. As regards the 1st proposal, by charging uniform rates on the whole Canal, the use of the

water is discouraged in proportion to the sufficiency of the rain-fall; and there-
by a greater supply is secured to the land which most requires it. But so far
as the water is applied, I question whether an irrigated crop of wheat at Jagraon
will ultimately prove to be more valuable than a similar crop at Malaut in the
Sirsa District. Then again, when the Settlement Officer contemplates arriving
at different rates for adjacent villages on the ground of advantages of soil and
local position, this seems to me dangerously akin to giving up the
principle of charging each irrigator primarily according to the volume of
water supplied. His 3rd proposal is more practicable, and is borrowed from our
land revenue khewats. But we have no power to impose on the irrigators
the system of distribution of charges which he contemplates. As soon as the
irrigating assessment was announced, the village would ask how it had been
arrived at; and when this question was answered they would be free either to
apply the Canal rates, or to substitute any others more convenient to themselves.
There is, however, one strong reason, why they should adhere to the Canal rates.
Two-thirds of the Canal assessment, or in some cases three-fourths, is due from
the actual cultivator; and only the remainder is paid from the rent share, *i. e.*,
only the owner's rate. This is the reason why Mr. Wilson's proposal has never
yet been acted on; it has probably occurred before now to many officers, both
Canal and district officers, that some such system would be desirable; but
attempts to arrive at it break down for the reason just stated.

6. I pass on to the proposals first drafted by me in my letter of the 12th October 1881, and to Mr. Walker's comments on them. I shall endeavour to treat the subject as briefly as possible; for I do not desire to trouble either Mr. Lyall or Colonel Home with discussions leading up to no practical result. Experience has

Proposals for Canal assessments first made by Settlement Commissioner, in October 1881, and Mr. Walker's comments considered.

Lands should be assessed according to the course of husbandry followed.

taught me that to most new suggestions relating to assessments it will be ob-
jected at first, that the people will dislike them, and that they will involve an
undesirable amount of interference, and increase the power of subordinates. To
this I would reply in the first place, that a pure assessment on crops, as our
Canal assessments at present are, involved these evils in the highest degree;
and that, though it may be useful and necessary for special reasons, and in a
certain degree to use the crops as guides to our assessments, still there is always
danger lest an assessment of this character shall unfairly tax industry; and also
lest it should lose sight of the main principle of a water charge, *viz.*, that it
should be according to the volume supplied and according to its abundance or
otherwise at the time of supply. The argument, for instance, that sugarcane
should be taxed high on account of its value, is unsound, for there is no crop
which owes its value so much to the industry with which it is tended, and to the
large amount of manure with which it is fed, and to the initial outlay of capital
required by it. But if we say that sugarcane shall be taxed higher than wheat
in proportion to the greater quantity of water supplied, and with reference to
the fact that much of this supply is given at a time (April to June), when the
water is specially valuable, the position is a sound one. To take a different ex-
ample, assessing purely on crops, as is now done, an irrigated crop of wheat
well nourished with manure pays the same tax, as an irrigated crop of wheat
that has not been manured. The yield in the former case is 20 maunds (1,600 lbs)
to the acre; in the latter case it is little more than half. To what is the
difference due? Not entirely to the manure; the manured wheat can and does
take a much larger quantity of water, than can be safely applied to the unmanur-
ed wheat. If the manured wheat takes a larger supply of water, than the un-
manured crop, is it right that the two crops should pay the same rates? With a
cotton crop the argument would be still stronger. Moreover, the present
system is not merely an assessment on crops; it is a system under which crops
that are usually manured are put in the same class with crops that usually are
not manured; whereas, I would submit, that the quantity of water that a culti-
vator will usually turn on to a field will always be materially determined by the
question whether it is manured or not and how much it has been manured.

7. Then of course the question arises, how are you to follow the manure and know what crop is manured and which is not. My answer is that you can always know the

Manured lands are distinguishable from those which are not.

area that is not manured; for long fallows are indispensable on such land as a sub-

stitute for manure. I shall not attempt a complete answer to what Mr. Walker
has written in the 2nd and 3rd paragraphs of his note. I think he has over-
stated his case; for instance, even in the Ludhiana *Bet*, where the twice cropped
land shifts most, and more in his opinion than it probably will with Canal irri-
gation, we were nevertheless obliged to base our assessments on the distinction
between land usually cropped twice and land not so cropped. All that I argue
for, is that you can mark off the land, on which long fallows are usually given.
And you can call the land on which such fallows are not given *Niai* or *dofasli* or
manured or any other convenient name; but the character of the husbandry on
it will be this; that fallowing is avoided by manuring; one valuable crop,
usually wheat, will be taken every year, and a 2nd crop also will often be taken
in the same year; or if it is not taken the single crop will be remarkably fine;
and the land which is treated in this way will always receive a much larger
quantity of water, than the land for the renovation of which the cultivator trusts
to fallows.

8. However, I give up the argument, as one on which a sufficient agreement of opinion cannot at present be expected; and I am free to admit, that the particular form

Contract system of assessment practicable in respect of manured land.

in which I first proposed to apply it may not be suitable or necessary. And if
I have succeeded in arousing attention to the subject in any degree, this will in
itself be a gain. At present, the annual Canal reports give no information
showing the system on which the Canal lands are husbanded. It has apparent-
ly been assumed that the solution of the question, how a contract system of
assessment can be arrived at, was very little connected with a sustained obser-
vation of the system of husbandry. Whereas, it seems to me highly probable,
that given a fixed guage at the head of the village channel, many villages would
contract to pay Rs. 5 or 6 per acre per annum for the irrigation of defined plots
of land; additional charges being made for other lands irrigated outside those
blocks. No such contract would be entered into, except in respect of lands
thoroughly manured; and in the sub-montane districts, where each village
usually has some homestead lands which have been heavily cropped for generations.
I know no instance where such husbandry has exhausted the land. Wherever
exhaustion is alleged, I find it is alleged in respect of lands that have not been
manured. If this discussion should appear to have in any way taken up un-
necessarily Mr. Lyall's and Colonel Home's time, I hope I shall be excused on the
ground that I have endeavoured to indicate that portion of the Canal irrigation
in respect of which a contract assessment is probably practicable.

9. In paragraphs 13 and 14 of his note, Mr. Walker proposes rates which compare with those proposed by Colonel Home as follows. The rates proposed by both officers are consolidated rates, that is to say, they do not contemplate any additional charge as owner's rate:—

Mr. Walker's rates compared with Colonel Home's.

Crop.	Rate per acre proposed by Mr. Walker. Rs. A. P.	Comparison with Colonel Home's rates.
Sugarcane	6 12 0	Colonel Home's rate is Rs. 7½.
Maize and cotton	4 8 0	Colonel Home's rate is the same for maize, but only Rs. 3¾ for cotton.
Wheat, indigo, other dyes, tobacco, vegetables, gardens, oil seeds, barley, wheat mixed with gram	3 6 0	Colonel Home's rates are for indigo, tobacco, vegetables, and gardens Rs. 4½; and for rabi crops Rs. 3¾.
Other kharif crops, also gram, barley and gram mixed with sarson	3 0 0	Colonel Home's rate is Rs. 2-10-0.
One watering before sowing	1 8 0	Colonel Home's rate is Rs. 2-4-0.
Other fallow waterings	0 12 0	Colonel Home's rate is ½ the above.

I have somewhat abbreviated the proposals. But the above gives a sufficient general view of them.

Mr. Walker writes in paragraph 15, as if the agriculture as hitherto followed is simpler than what existed when we first developed irrigation in the Bari Doab and in the country west of the Jamna. I doubt if this is so. But our endeavour to limit irrigation in each village to a 3rd or 5th of the area introduce this new feature into the case, that the inferior crops will be left almost entirely to the unirrigated area.

Crop details of existing irrigation on the Bari Doab and Western Jamna Canals.

10. I append 7 tables in which I have endeavoured to show in small compass what information as to the system of cultivation on the Bari Doab and Western Jamna Canals was available in the last annual report of the Irrigation departmrnt. These tables give some useful indications. I will take the crops in the order of Colonel Home's classification.

Class V. Fallow watering.—There are hardly any in the rabi; and in the kharif the waterings are only 1 per cent., on the Bari Doab, and 3 per cent. on the Western Jamna Canal of the area irrigated in that season. The conclusion would scarcely be wrong, that these waterings are given almost entirely with the object of securing an early and good sowing of the rabi.

Class IV.—Masur is hardly irrigated at all on either Canal. Gram covers 3 per cent. of the whole area irrigated in a year by the Bari Doab, and 4 per cent. of the area irrigated by the Western Jamna. On both Canals this crop seems to be irrigated only in the districts at a distance from the Hills. The area of the kharif crops falling in this class is small; on the Western Jamna Canal a tenth of the whole kharif and on the Bari Doab a third.

Class II. and III.—On both Canals four-fifths of the rabi is wheat and barley, and of the kharif a third is under cotton and maize.

Class I.—Both the Western Jamna and the Bari Doab have a third of their kharif area under rice; and sugarcane covers a fifth of the kharif area on the Western Jamna, and about half that amount on the Bari Doab.

To sum up; in both harvests the area under dyes, drugs, and vegetables is unimportant. Four-fifth of the rabi is wheat. Of the kharif a third is rice, a third is maize and cotton, and of the rest, speaking roughly, half is sugarcane and a half is inferior crops.

Rates for assessments recommended by Settlement Commissioner.

11. Details of this character very much simplify the problem before us. In the following remarks the whole charges, both owners and occupier's rates, are treated as one. First as regards Class V, the fallow waterings, we can I think afford to be a little more liberal than Colonel Home's proposal contemplates. The watering will occur almost entirely in September and October to prepare the ground for rabi sowing. I agree with Mr. Walker that the rate should be 5 annas per local biga. (The equivalents in other measures are given in the margin. The acre rate will be used solely in English return). Whatever argument may be urged on the ground of the valuable nature of the assistance given by a watering at sowing time, it seems to me that judging by present experience, no considerable amount of revenue is at stake. And I do not think that when starting a new Canal we should charge a higher rate than prevails either on the Western Jumna or on the Bari Doab. If a higher rate is thought justifiable, let it be first introduced on one of those Canals.

6 annas per local Biga equals
Re 0 15 0 per Shahjehani or pakka biga used in Sirsa.
Re 1 4 0 per Ferozepore ghumao.
Re 1 8 0 per acre.

Class IV.—Colonel Home proposes Rs. 2-10-0 per acre for kharif crops, also for gram. Mr. Walker proposes Rs. 3, and would add the mixed crop, barley and gram. The rate on the Western Jumna is Rs. 2-8-0, and on the Bari Doab the same, adding the rabi pulses and fodder grasses. If Colonel Home's

proposal is adopted the rate should not be Rs. 2-10-0 per acre, but Rs. 2-11-2, in order that the acre rate may fit conveniently into the local measures. But my own inclination is to adopt Mr. Walker's rate of Rs. 3, but to throw in every *kharif crop, except sugarcane,* rice and water-nuts.

Rs. 2-11-2 per acre equals 9 annas per Ludhiana biga.
Re. 1-11-0 per Sirsa biga.
Rs. 2-4-0 per Ferozepore ghumao.

Class III.—Colonel Home proposes for cotton and all rabi crops, except gram, Rs. 3-12-0; Mr. Walker, Rs. 3-6-0. I would suggest that these two proposals should be adjusted respectively to 11 and 12 annas the Ludhiana biga, * that is to say, either to Rs. 3-9-6 or Rs. 3-4-8 per acre. The rate on the Western Jumna is Rs. 3-6-0 and on the Bari Doab about the same. I would myself recommend Rs. 3 per acre or 10 annas per Ludhiana biga. This is the rate paid on the Ganges and Eastern Jumna Canals; and it seems to me sufficient. I notice that Colonel Brownlow's proposed rate on wheat is Rs. 2-8-0 or with one-third occupier's rate added Rs. 3-5-0.

* A rate per acre of			Equals.					
			Per Ludhiana biga.		Per Sirsa biga.		Per Ferozepore ghumao.	
R.	A.	P.	R.	A.	R.	A.	R.	A.
3	14	2	0	13	2	7	3	4
3	9	6	0	12	2	4	3	0
3	4	8	0	11	2	1	2	12

There will then remain for the 1st class sugarcane, rice and water-nuts. For these Colonel Home proposes Rs. 7-8-0. The rate paid on the Western Jumna is for sugarcane Rs. 7-8-0 and for rice and water-nuts Rs. 4-8-0, and on the Bari Doab from Rs. 7-8-0 to Rs. 6-4-0. Mr. Walker proposes Rs. 6-12-0 for sugarcane; and rice he does not think will be much cultivated, at least in the west end of the Ludhiana district. The Agra Canal rate for these crops is nearly Rs. 9. I confess I think it is for consideration whether Colonel Home's rates on these crops are not a little high. I should have been inclined to propose double the rabi rate or Rs. 6 per acre. It is true that rice and water-nuts take a great deal of water; but they take it at a time when it is abundant. As to sugarcane, its cultivation demands so much manure and steady industry, that I would at least at present tax it rather lightly.

Further explanation of rates.

12. There are two points on which the above recommendations differ materially from Colonel Home and Mr. Walker, as regards which further explanation appears necessary. Mr. Walker wishes to tax maize and cotton one-third more than wheat; Colonel Home would tax maize, as Mr. Walker recommends, but cotton the same as wheat. Again, in Colonel Home's proposed schedule, tobacco, vegetables, poppies, and gardens, are classed higher than wheat. As regards gardens I think the Bari Doab rule is right; the charge should be by the half year. It does not much matter what the rate is. But for the present I would not charge more than the rate for wheat. Orchards should be charged for the season in which they fruit; if they fruit in both seasons, the charge should be as for gardens; the rate per season should be the same as for wheat. Opium, tobacco, and vegetables, I would also charge the same as for wheat. The areas are small; the life of these crops is short; and the water is taken when it can be spared; and they owe their success as much to manure and industry as to the water. The irrigating life of cotton is 7 months, of maize $3\frac{1}{2}$ months if so long. Maize takes its water, when the Canal is fullest; its yield and value is no doubt high, but there is no crops (not excepting sugarcane) so absolutely dependent on manure. It will yield with a poor supply of manure, only poorly; and when it yields richly, as it usually does, this is because the cultivator gives to it all the manure he can spare from his cane, knowing that he can follow it with wheat. In the same way the excellence of the yield of cotton is almost entirely dependent on the extent to which the land has been manured. The Western Jumna rate on cotton is Rs. 3-6-0, and on maize Rs. 2-8-0. The Bari Doab rates are about the same. And as I before remarked in the case of the fallow ploughings, we ought when starting new Canals to be on our guard against introducing higher charges than have as yet succeeded on other Canals. The Agra Canal rate is for cotton the same as for wheat, Rs. 4; and for maize the same as for jowar Rs. 2-10-8.

Abstract of rates recommended by Settlement Commissioner.

13. To resume, the rates which I recommend are :—

	Rate per acre.		Equivalent in local measures.					
			Ludhiana biga. 1,008½ square yards.		Sirsa biga. 3,025 square yards.		Ferozepore ghumao. 4,000 square yards.	
	R.	A.	R.	A.	R.	A.	R.	A.
I.—Sugarcane, rice and water-nuts	6	0	1	4	3	12	5	0
II.—All other crops	3	0	0	10	1	14	2	8
III.—Fallow waterings	1	8	0	5	0	15	1	4
V.—Gardens per half year the same as Class II.	...		...		...		...	
VI.—Timber plantations, half of Class II. rate per half year.	...		...		...		...	

I do not think these rates would need altering for a long time. They are not in any case higher, than have hitherto actually succeeded on the Western Jamna and Bari Doab Canals. The rate on kharif crops is apparently higher; but not really so because it includes indigo and cotton. The latter crop is a sixth of the kharif on the Bari Doab, and a third on the Western Jumna Canal. In the Hansi Division of the latter Canal the cotton is nearly half of the kharif. I therefore think I am right in saying that the rates proposed by me will not in effect be higher than those which have already succeeded on other Canals. The effect of charging gram and barley with gram Rs. 3, will probably be that usually only one watering will be taken for these crops, before sowing, and this watering will usually be sufficient to ensure their success. A second watering will not be turned on, unless the winter rains fail entirely which they rarely do. But in such cases the Rs. 3 charge would be fair. I do not think there is a necessity for a greater amplification of rates on account of crops of small areas; and the tendency of these amplifications of rates appears to me to be to invade the returns due to industry and manure; and, in respect of gardens, orchards and plantations, to overlook Government desire to encourage arboriculture of all kinds in a country at present almost destitute of trees.

Maintenance or otherwise of owner's rate.

14. There remains the vexed question, whether the rate shall be consolidated in one charge, or divided into occupier's and owner's rate as contemplated by Section 37 of the Canal Act. After considering all that has been written against the owner's rate, I cannot bring myself to the opinion that it should be merged in the occupier's rate. There appear from the papers before me to be two propositions, both of which are equally aimed at the suppression of a separate owner's rate for the present. One proposition is that only one consolidated rate should be permanently charged; another is that while charging a consolidated rate for the present, we should trust to future settlement operations as the means eventually of following the increased profits due to irrigation which are secured by owners. As regards the latter of these two propositions, I would observe that in the Bari Doab and on the Western Jumna former settlements were made on the plan now contemplated. I know that the work was done too roughly; and that it may be practicable to avoid in the future the error which in the case of these two Canals compelled us to substitute the system of owner's rate. But I have not yet seen any sketch of how such an assessment of owner's irrigating profits could be made, as regards which I could feel sure that it would not substantially lead us into the same old difficulties. As I have said in a previous part of this letter, it is one thing to propound a sound principle of assessment, but often a much more difficult thing to apply it successfully. As regards the other proposition, that we should accept as a final arrangement the system of making one consolidated charge leviable from the irrigator, my view is, as already explained in paragraph 2 of my letter of the 12th October enclosed, that *quoad* the cultivating owner there is no necessity for such a

charge; but that *quoad* the tenant it is of questionable expediency. I agree with Mr. Walker in thinking that one effect of Canal irrigation will probably be to increase the number of tenancies. The foundation of all rents in this part of India is the division of the produce between the owner and the tenant. That is the idea constantly present to their minds in their dealings with each other. In so far as the State insists plainly on levying part of the irrigation charge from the tenant's share of the produce, and part from the owner's share, it may not indeed prevent the owner from calling on the tenant to pay both; but it is going rather far to say that the amount and form of the State's demand will have no effect on the amount of the rent which the tenant contracts to pay. Unless this can be asserted, the owner's rate serves its purpose, even though the tenant pays it. The merit of the owner's rate is, that it asserts plainly and continuously the State's right to share in the increase of the owner's rent due to irrigation, and that it does so in a form which nevertheless leaves the irrigators perfectly free to take water or not. Granting all that can be said against it, that it complicates the accounts and cannot be adjusted to the different circumstances of different villages; I still think that it is the best means yet devised for the purpose of following the owner's share of produce due to irrigation, and that it is premature to attempt to strike out a different system; and I recommend that the rule recently adopted for the Western Jumna Canal be applied, under which the owner's rate is taken at half the occupier's rate. In this case, of the rates above proposed in paragraph 12, two-thirds would be occupier's rate, and one-third owner's rate.

Paragraph 9 of his note.

One-half rates on irrigated lands for first two years.

15. As regards the proposal to charge half rates on irrigated land for the first two years of its irrigation, I think it would encourage the spread of irrigation if half rates were allowed for the first year. I am not sure that such a remission is necessary for two years; especially as all the expensive water-courses will be made by Government; but it would certainly be much appreciated.

Proposed deputation of a Settlement officer during first years of Canal working.

16. General Gulliver proposed, that, if possible, some officers of experience in the settlement should be associated with the Canal officers during the time that the arrangements for the distribution of the water inside each village are being worked out; and the Government in their letter under reply express their willingness to act on this proposal. If paragraph 7 of Mr. Walker's note and paragraph 15 of my letter dated 12th October last, herewith enclosed, be referred to, it will be seen that both of us are anxious that it should be adopted. It would not be difficult to nominate officers for this purpose. There should be one Settlement Officer, and under him two native officials of the rank of Deputy Collector or Settlement Superintendent. The Settlement officer should work under the orders of the Superintending Engineer of the Canal, his two native assistants under the orders of the Divisional Executive Engineers. But it would be the Settlement officer's duty to see that the interior village work was being done by these native assistants on proper lines. He would be in communication equally with the Superintending Engineer and with the Divisional officers. I do not anticipate that any of the higher officers of the Canal would be unwilling to receive assistance of this nature; but if the Settlement officer considered that any arrangements desired by the Canal management were likely to injure the irrigators or to cause unnecessary inconvenience, then I feel sure that the Chief Engineer would be willing to consult the Financial Commissioner; as indeed is already usually done on points of difficulty under the present system. The effect of the arrangements proposed would be to give to the Canal management at the commencement of their work, skilled assistance in order to the better adjustment of the interior distribution inside each village to the village tenures and necessities, and in order to the preparation of a convenient record thereof.

Deprecates the creation of a separate body of Canal patwaris.

17. In connection with this subject, I venture to urge very strongly, that an effort be made to utilize the village patwaris for Canal work, and to avoid the entertainment of a separate staff of Canal patwaris. I made some remarks on this subject in paragraph 16 of my letter of the 12th October last (enclosed). I am not sure

that Mr. Lyall will entirely agree with me, as some difficulties in utilizing district patwaris have been felt on the Upper Sutlej Canals in the Ferozepore district. But the universal dislike of the people to the multiplication of petty officials seems so me to be so thoroughly just and well founded that I think a separate staff of Canal patwaris ought not to be appointed, until an effort has been made to obtain all necessary assistance and returns from the district patwaris. If the proposals of the previous paragraph are adopted, the attempt to utilize the district patwaris will be made under very favorable conditions. What is probably required is a sufficient development of co-operation between the Canal amins and patrols on the one hand, and the village patwaris on the other hand. No doubt it must be difficult for an Engineer unacquainted with our land revenue system to arrange this to his own satisfaction, and also to the satisfaction of the district authorities. But I feel convinced, that if the subject were placed for two years in the hands of a Settlement officer of experience, he would establish such a system as would enable the Canal management to utilize the service of the ordinary patwaris to a very material extent, a small number of Canal amins, working to some extent as patwari supervisors or co-adjutors for Canal returns, will no doubt always be required. But this is a very different thing from having a complete set of Canal patwaris working independently of the village patwari, and keeping separate village accounts and returns.

See Colonel Home's account of the duties of Canal officials in the Proceedings of the Punjab Government for March 1876.

BARI DOAB CANAL.

I. A.—Percentage of crops of each class (paragraph 37, Report of 1880-81).

Class.	1876-77.	1877-78.	1878-79.	1879-80.	1880-81.
Class I. ...	3·7	2·3	2·6	2·7	2·8
„ II. ...	13·7	9·3	11·4	11·0	10·4
„ III. ...	60·1	58·8	66·3	60·8	61·4
„ IV. ...	22·0	27·2	19·1	25·0	24·8
„ V. ...	0·5	2·4	0·6	0·5	0·6
Total ...	100	100	100	100	100

WESTERN JUMNA CANAL.

I. B.—Percentage of crops of each class.

Class.	1880-81.
Class I. ...	10·3
„ II. ...	20·3
„ III. ...	62·0
„ IV. ...	5·5
„ V. ...	1·9
Total ...	100

BARI DOAB CANAL.

II. A.—Distribution of crops, Rabi and Kharif; and area of twice cropped land (paragraph 34 of Report, 1880-81).

	1876-77,	1877-78.	1878-79.	1879-80.	1880-81.	Average.
Total area irrigated ...	202,712	266,995	327,558	393,317	433,080	324,732
Per cent. of which rabi ...	63·0	67·9	64·4	62·0	65·1	64·5
Ditto ditto kharif ...	37·0	32·1	35·6	38·0	34·9	35·5
Ditto of twice cropped land	13·0	10·5	10·2	13·6	13·1	12·1
Ditto of sugarcane ...	...	...	...	...	8	...

WESTERN JUMNA CANAL.

II. B.—Distribution of crops, Rabi and Kharif; and area of twice cropped land (paragraph 15 of Report, 1880-81.)

	1876-77.	1877-78.	1878-79.	1879-80.	1880-81.	Average.
Total area irrigated ...	366,482	507,974	398,460	310,686	265,551	369,831
Per cent. of which rabi ...	52·05	57·65	48·71	43·95	45·52	49·58
Ditto ditto kharif ...	47·95	42·35	51·29	56·05	54·48	50·42
Ditto of twice cropped land	10·7	16·8	14·3	12·3	6·8	12·2
Ditto of sugarcane ...	...	...	...	...	14	...

E. G. WACE, *Major*,

Settlement Commissioner.

III.—Table showing in percentages the prevailing crops on the Bari Doab and Western Jumna Canals.

Harvests.	Crops.	Class in which reckoned.		Western Jumna Canal.				Bari Doab Canal.			Remarks.
		Western Canal.	Bari Doab Canal.	Karnal Division.	Hansi Division.	Delhi Division.	Total.	1st Division.	2nd Division.	Total.	
Kharif.	Sugarcane and gardens *	I	I & II	7	8	34	18	15	6	8	
	Rice	II	II	60	26	35	33	39	27	30	
	Dyes, drugs, &c., ... (Turmeric, indigo, tobacco, chillies, vegetables and orchards) ...	II & III	III	4	6	2	4	1	2	2	
	Cotton	III	III	8	45	19	31	11	17	16	
	Maize	IV	IV	13	...	2	2	...	17	13	
	Jowar	IV	IV	1	12	3	7	20	12	13	
	Fodder (chari, &c.) ...	III & IV	IV	...	1	1	1	9	...	3	
	Miscellaneous	III & IV	III & IV	2	...	1	1	3	18	14	
	Fallow waterings ...	V	V	5	2	3	3	2	1	1	
	Total ...	...	...	100	100	100	100	100	100	100	
Rabi.	Gardens, tobacco and poppy	I & II	II & III	5	2	...	2	1	...	1	
	Spices, vegetables and dyes	II & III	III	1	2	3	3	...	2	1	
	Wheat	III	III	74	74	88	77	80	78	78	
	Barley	III	III	9	4	...	3	1	2	2	
	Gram	III	IV	1	14	...	10	5	5	5	
	Wheat and barley mixed with gram	III	III	...	2	7	3	3	2	2	
	Fodder (sinji &c.) ...	IV	IV	...	...	...	...	9	10	10	
	Miscellaneous	III & IV	III & IV	4	1	1	1	1	1	1	
	Fallow waterings ...	V	V	6	1	1	1	...	...	...	
	Total ...	...	...	100	100	100	100	100	100	100	

* In Western Jumna Canal the entry includes 2,467 acres (4 per cent.) of gardens (Delhi Division). In Bari Doab Canal it includes 244 acres gardens.

E. G. Wace, *Major*,

Settlement Commissioner, Punjab.

Bari Doab Canal.

IV A.—Crops of 1880-81 *in acres.*

Harvest.	Class and Crop.	1st Division.	2nd Division.	Total.
		Acres.	Acres.	Acres.
Kharif.	Class I.			
	Sugarcane	5,228	7,168	12,396
	Class II.			
	Rice	13,838	30,583	44,421
	Gardens	85	159	244
	Total	13,923	30,742	44,665
	Class III.			
	Fibres—Cotton...	3,810	19,504	23,314
	Hemp	115	317	432
	Dyes, drugs &c.,—Turmeric	7	...	7
	Indigo	...	8	8
	Tobacco	50	282	332
	Oil seeds—Til (sesamum)	699	369	1,068
	Toria	8	...	8
	Miscellaneous—Vegetables	179	626	805
	Orchards	10	2,070	2,080
	Total	4,878	23,176	28,054
	Class IV.			
	Cereals—Jowar (Great millet)	6,887	13,310	20,197
	Kangni (Italian millet)	...	1,204	1,204
	Maize (Indian Corn)	...	20,000	20,000
	Fodder grasses...	3,224	541	3,765
	Miscellaneous	353	18,693	19,046
	Total	10,464	53,748	64,212
	Class V.			
	Fallow lands	696	1,080	1,776
	Total Kharif	35,188	115,914	151,103
Rabi.	Class I.			
	Sugarcane	1	...	1
	Class II.			
	Gardens	86	169	255
	Rice	4	169	173
	Total	90	338	428
	Class III.			
	Cereals—Wheat	41,503	178,335	219,838
	Barley	710	5,076	5,786
	Mixed Grain	1,412	4,730	6,142
	Oil seeds—Linseed	21	75	96
	Sarson	229	972	1,201
	Toria	...	35	35
	Dyes &c.,—Poppies	68	487	555
	Tobacco	143	301	444
	Miscellaneous—Safflower	1	...	1
	Vegetables	135	2,215	2,350
	Orchards	8	1,348	1,356
	Total	44,230	193,574	237,804
	Class IV.			
	Pulses—Gram	2,846	11,149	13,995
	Masur	1	201	202
	China	15	755	770
	Fodder—Grass	...	468	468
	Sinji	4,717	21,974	26,691
	Miscellaneous	6	923	929
	Total	7,585	35,470	43,055
	Class V.			
	Fallow lands	258	430	688
	Total Rabi	52,164	229,812	281,976
	Grand Total	87,353	345,726	433,079

E. G. Wace, *Major*,

Settlement Commissioner, Punjab.

WESTERN JUMNA CANAL.

IV B.—Crops of 1880-81 in Acres.

Harvest.	Class and Crop.		Karnal Division.	Hansi Division.	Delhi Division.	Total.
			Acres.	Acres.	Acres.	Acres.
Kharif.	*Class I.*					
	Gardens		...	...	2,467	2,467
	Sugarcane		1,070	5,442	17,334	23,846
		Total	1,070	5,442	19,801	26,313
	Class II.					
	Cereals	Rice	9,264	18,717	20,391	48,372
	Drugs	Tobacco	6	...	48	54
	Spices	Chillies	5	447	34	486
	Miscellaneous	Vegetables	114	183	382	679
		Singharas (water-nuts)	192	...	167	359
		Melons	...	...	10	10
		Onions	1	...	...	1
		Total	9,582	19,347	21,032	49,961
	Class III.					
	Fibres	Cotton	1,225	31,512	11,476	44,213
	Dyes	Indigo	430	4,398	519	5,347
	Oil-seeds	Toria	13	...	...	13
	Fodder	Lucerne grass	...	292	6	298
		Total	1,668	36,202	12,001	49,871
	Class IV.					
	Cereals	Maize (makai)	1,924	269	1,145	3,338
		Jowar (great millet)	143	8,145	1,712	10,000
		Bajra (spiked millet)	17	39	75	131
		Mundwa				
		Kulthi	63	...	...	63
		Kangni	1	...	...	1
		China	...	4	...	4
	Oil-seeds	Til	36	...	12	48
	Pulses	Urad	...	37	61	98
		Moth	...	101	...	101
	Fibres	Hemp	...	15	63	78
	Fodder	Chari	...	79	13	92
		Country grass	...	4	337	341
	Cereals	Mundwa, Kangni	...	34	79	113
	Pulses	Urad	...	...	224	224
		Total	2,184	8,727	3,721	14,632
	Class V.					
	Fallow land	Palawar	789	1,039	2,064	3,892
		Total Kharif	15,293	70,757	58,619	1,44,669
		Carried over	15,293	70,757	58,619	1,44,669

WESTERN JUMNA CANAL.

IV B.—Crops of 1880-81 in Acres.

Harvest.	Class and Crop.		Karnal Division.	Hansi Division.	Delhi Division.	Total.
			Acres.	Acres.	Acres.	Acres.
Rabi.		Brought forward	15,293	70,757	58,619	1,44,669
	Class I.					
	Gardens		104	799	13	916
	Class II.					
	Drugs	Tobacco	79	970	50	1,099
		Poppy head	38	...	...	38
	Spices	Ajwain (Ptychotis)	...	395	32	427
		Dhania	...	341	...	341
		Hallon	...	5	...	5
		Methi (Trigonella)	16	619	705	1,340
		Chillies	...	2	...	2
		Saunf	...	2	...	2
	Miscellaneous	Vegetables	34	304	241	579
		Onions	11	119	15	145
		Carrots	2	164	22	188
		Melons	...	...	2	2
		Total	180	2,921	1,067	4,168
	Class III.					
	Cereals	Wheat	3,822	62,931	26,891	93,544
		Barley	467	3,430	10	3,907
		Gram	61	12,029	137	12,227
	Mixed grains	Barley and Gram	...	160	2,001	2,161
		Wheat and Gram	18	304	...	322
		Barley and Masur	...	890	...	890
	Dyes	Safflower	...	...	2	2
	Oil-seeds	Sarson	2	24	1	27
		Karar	...	1	...	1
		Toria	165	16	...	181
		Linseed	1	...	...	1
	Pulses	Masur	32	279	197	508
		Arhar	...	1	...	1
	Fodder	Lucerne grass	...	375	...	375
		Oats (Javi)	...	135	72	207
		Total	4,568	80,575	29,311	1,14,454
	Class IV.					
	Cereals	China	...	3	1	4
		Maize (makai)	2	...	...	2
	Fodder	Country grass	17	18	37	72
		Chari	...	31	...	31
		Lucerne grass	...	...	6	6
		Total	19	52	44	115
	Class V.					
	Fallow land		282	699	249	1,230
		Total Rabi	5,153	85,046	30,684	1,20,883
		Grand Total	20,446	1,55,803	89,303	2,65,552

E. G. WACE, *Major*,

Settlement Commissioner, Punjab.

Copy of paragraphs 1 to 8 and 14 to 16 of a letter No. 1088, dated 12th October 1881, from Major E. G. Wace, Settlement Commissioner, Punjab, to the Superintending Engineer, Sirhind Canal.

You recently consulted me concerning the scale of irrigation rates to be applied on the Sirhind Canal, when it is opened next year; and our conversation on this subject led on to other matters connected with the revenue management of the Canal. I have now the honor to place before you at your invitation the following suggestions on these subjects.

2. The first question mooted was whether the whole irrigation rates should be levied by one charge, or whether the existing system of levying part by an owner's rate, and part by an occupier's rate, should be continued. I do not myself think it is worth while to modify the existing system. On all lands, where the relation of landlord and tenant does not exist, that is to say where the irrigating cultivator owns his own land, both owner's and occupier's rates are paid by the same person. On such lands the cultivating tenure operates to unify the two rates, and no further simplication is required. As a matter of fact, the contemplated change of system would only affect these lands, where the irrigating cultivator is a tenant paying to an owner a true rent either in cash or by division of produce. Speaking very roughly in the Ferozepore district about one-third and in the western half of the Sirsa district, two-thirds of the cultivation are held by tenants. In the Mukatsar tahsil, of the Ferozepore district, about half of the cultivation is held by tenants. It is certain that the effect of Canal irrigation will be to raise the rents paid by these tenants; and this will occur equally, no matter by which of the two systems under discussion the Canal charges are levied. Under the existing system of levying these charges by two rates (owner's and occupiers), Government are sure to secure a due share of the increased rents levied by owner's from tenants. But if these two rates are consolidated, and the payment of both by a tenant is made a condition of his obtaining water, the position of the tenant (who is weaker than the owner) will be made by so much the harder. The justice of the change will depend entirely on the tenant being able to obtain in some form or other from the owner an abatement of the full irrigating rent, of not less amount than what Government now levies directly from the owners as owners' rate. An assumption of this nature is purely speculative; and in the existing relations of owners and tenants, I am incredulous as to its realization. The existing system seems to me much safer and simpler; we deal directly both with owners and with tenants. The tenant takes the greater share of the produce, and pays the major share of the irrigating charges; the owner contributes a smaller portion assessed with reference to the ratio in which irrigation has increased his rent. This is a simple system, and especially well suited to a new Canal. If speculative changes are desired, they should be introduced not on a new Canal, but on an old one, where irrigation and its effects on the owner and tenants have presumably been fully developed, and where consequently we shall have some safe grounds for judging whether the change is likely to conduce to the general convenience, and to operate fairly as between owner and tenant.

3. The next question was the applicability to the Sirhind Canal of the rates now charged on the Western Jumna and Bari Doab and Agra Canals. It will be sufficient for present purposes to speak of the Western Jumna rates. They are, as follows, per acre:—

Occupier's rates.

	Rs.	A.	P.
Flow, full rate; lift, two-third rate.			
Class I.—Sugarcane and gardens	5	0	0
" II.—Rice, tobacco, opium, vegetables and water-nuts ...	3	0	0
" III.—Indigo, cotton and spring crops	2	4	0
" IV.—All autumn crops, except indigo and cotton ...	1	10	8
Watering before sowing	1	0	0

Owner's rates.—Half of occupier's rates.

I do not think these rates are higher than the people will willingly pay when they have practically ascertained the extent to which irrigation will increase the produce of their lands. But after giving much thought to the matter, I think the rates are framed on a wrong system.

4. I have been led to this opinion by the anxiety I feel concerning the manner, in which the introduction of irrigation into the country traversed by the Sirhind Canal is likely to affect the pre-established system of cultivation. We need to remember that the agriculturists of this tract are quite ignorant of the probable effect of irrigation on their land, and it is a common thing to be told by them that they hear that irrigation will yield splendid crops for two or three years, and then very poor crops. This will no doubt happen, if they go on cultivating unmanured land, as often as they can get water for it. The question, therefore, which I would put in the first place, is whether Government propose to leave the people to find their own way out of this ignorance by hard experience? I am confident that Government will not willingly answer this question in the affirmative, and I proceed to explain what appears to me to be a true and safe solution of it.

5. The primary object of the Canal is to place tracts with a scanty rain-fall, in a position as secure and favorable as tracts with a good rain-fall. In the submontane tracts of the Sirhind Doab, we have an old established and well tried system of agriculture, supported almost solely by rain; a system yielding excellent crops, and under which the land shows no signs of exhaustion. The Canal rules should therefore be so framed, as (1), to encourage the irrigators to apply to their comparatively rain-less lands the same system of cultivation, as experience has shown to be sound in the submontane tracts; and (2), to check any attempt on the part of the irrigators to cultivate their lands in a manner which judging from the same experience is likely to exhaust the land.

6. The agricultural system of submontane tracts well supplied with rain is as follows:—

(i). There is a small area round the village site, commonly known as Niai. It gets the village drainage and refuse, and is highly manured; it yields with hardly any remission either sugarcane or two crops of the best cereals per annum.

(ii). The rest of the land is not manured, and is cultivated on one of two systems of which one may be conveniently referred to as *Sanwi*, and the other as *Ekfasli*.* I will first describe the *Sanwi* cultivation. This is land ploughed, as often as possible, from January to September; it is then sown with a rabi, usually wheat, or wheat and gram mixed; the rabi is reaped in May, and is followed at once with a kharif, usually bajra or jowar, with pulse mixed. The *Sanwi* course thus lasts two years, *viz.*, fallow with ploughing one year, and two crops in the second year. I have described this system at length in my No. 219, dated 28th July last, to the address of the Settlement Secretary to Financial Commissioner, of which a copy has been forwarded to you. The system depends for its success on the cultivator being able to plough the land several times over in January, April, and again before the wheat sowing. The submontane rains enable him to do this; he thereby makes the seed-bed accessible to the action of the air and to the sun's heat. The previous two crops have partly exhausted the small portion of the soil, which nourishes plants; but, under the continued action of damp, air and sun, a further disintegration and renovation of the soil of the seed-bed takes place; and when September comes round, the soil is again in a condition to nourish two more crops of cereals. In short, the system recognises two fundamental facts; (1), that if you cannot renovate land by manure, you must do it by rest; (2), that the period of necessary rest can be shortened, and its renovating effect enhanced by, at the same time thoroughly exposing the land to the combined action of damp, heat and air.

* I am obliged to borrow these terms for this purpose. The people use them, but not quite in this way.

(iii). The *Ekfasli* cultivation is confined to poor and usually sandy land. Either a rabi is taken every year with little intermisson, or a kharif is taken. The agriculturists will never cultivate good land on this system; and the yield whether rabi or kharif is always much inferior to that of the *Sanwi* cultivation.

7. The cultivators of the dry tracts traversed by the Sirhind Canal are nearly all of them either themselves immigrants or the descendents of immigrants from the submontane tracts, where the system above described prevailed. The system itself is well known to them, and they themselves follow it as far as possible; and if the Canal rules are so framed as to maintain that system, the irrigators will readily respond in the same direction; and we need then have little fear that the Canal water will prove otherwise than a benefit to them. The Western Jumna Canal rules are not framed with this object; and it is of the greatest importance, that before they are applied to the Sirhind Canal they should be modified so as to secure it, and it will be seen that in thus modifying the rules besides securing the land from injury we shall very much simplify the revenue management of the Canal.

8. In the annexed draft rules, I have reduced into the form of definite propositions the system which I would advocate. My proposals to levy water-rates, not by crops, but by the system of cultivation, will no doubt provoke criticism. I do not wish to forestall this; though I should like to have an opportunity of replying to it. Every one will admit readily that my proposals would greatly simplify the annual assessments, if they can be adopted without sacrificing revenue. I believe they can with perhaps two or three slight modifications (*e. g.*, as regards rice and sugarcane); and so far as these are necessary they will be brought out by criticism. It will be noticed that I propose to give to *Sanwi* lands two free waterings in the year that they lie fallow. I propose this on the ground that it would be both unfair and economically unsound to make any additional charge for waterings essential to the proper cultivation of the crops on which rates are paid.

14. In paragraph 8 of the annexed draft I have recommended that the irrigating outlets in the Rajbahas shall be as far as possible village outlets; and that the system of giving outlets to individual irrigators shall be discouraged. If the system of cultivation already existing (principally *Sanwi*), which I have fully described in my previous letter quoted above in paragraph 6 (II). is to be maintained, then we shall necessarily be obliged to adopt usually the system of village outlets. Nor is there any reason why such a system should not succeed. The Jats of the country, which the Sirhind Canal will irrigate, are remarkable for their habits of organization and co-operation; and for the way in which each village holds together. The management of their wells, whether for irrigation in the Ludhiana district, or for drinking purposes near the Sirsa border, affords strong evidence of this. The wells are usually owned by the whole village or by a sub-division of it, and each man has his turn of duty in working them. Disputes are very rare. On the other hand if a few men in the village were to get ahead of the rest and obtain an outlet to themselves, as soon as the rest of the community perceived that they were at a disadvantage, considerable jealousy would arise, and this would involve much opposition to the laying out of the smaller distributories. If we address ourselves to each village as a whole, they will either refuse the water or take it, and if they take it, they are likely in the great majority of cases to distribute it fairly among themselves, with little further assistance. The Sirhind Canal is exceedingly fortunate in this respect. It has to deal with a cultivating peasantry, who for intelligence and powers of organization are equalled in few districts in India, if in any.

15. There still remains a matter of the greatest importance. Shortly before Sir Richard Strachey left India, the Supreme Government, I believe, suggested the desirability of employing a Settlement officer on each Canal, primarily, in order to the better assessment of the water-rates. I think that this idea might be usefully developed on the Sirhind Canal. In the management of its ordinary land revenue, Government has found it expedient to employ

experts for special works, that is to say, the revenue being first carefully assessed by Settlement officers, its subsequent collection becomes an operation of comparative facility. Similarly, I would urge that a selected officer should be employed at once on the Sirhind Canal, whose special duty it should be to make what I may describe as a kind of Canal settlement. The Engineering officers having constructed the Rajbahas, it would be the duty of the Settlement officer to settle the manner in which the irrigation should be introduced into each village, and the water-rates to be paid; he would also arrange the duties which will be discharged and the returns which should be submitted by the village headmen and patwaris in connection with the Canal irrigation. He should be assisted by one, or if necessary two, native officials of the rank of Extra Assistant Commissioner, who should be chosen either from the Settlement department or from among those who have been previously employed in that department.

* * * * * * *

An officer of this experience and with this knowledge of the agricultural classes and their tenures will at once command the confidence of the people in his efforts to introduce irrigation in the manner best suited to local tenures and agriculture. If the task is entrusted to Engineers, who have no detailed knowledge of the people and their agriculture, then I fear that, however anxious they may be to do justice to this duty, they will not be able to command the confidence of the people to the same extent, the development of the irrigation is likely to be slower, the undoubted capacity of the people to manage for themselves the distribution of the water inside each village will not be sufficiently taken advantage of, and there will be a tendency to develop a more detailed, more expensive, and less simple system of revenue management, than is likely to be worked out by a Settlement Officer who possesses a complete knowledge of the people and of the whole revenue agency (Canal district and village officials) at his command.

16. It follows obviously from the consideration above urged that I deprecate the introduction of separate Canal patwaris, such as are employed on the Western Jamna Canal. On the Bari Doab Canal and on the Canals in the Mooltan Division the village patwaris perform all the additional duties arising out of Canal irrigation, which are proper to their office, and I am confident that on the Sirhind Canal a like arrangement can be arrived at. Whatever difficulties might be pointed out by a Canal Officer, they can, I feel sure, be met by proper rules, and the agriculturists entertain very strong and well founded objections to the multiplication of officials of this class. And finally I would add that every extra class of officials raises the cost of the revenue management.

Copy of rough sketch of suggested rules for the supply of water and for water-rates on the Sirhind Canal.

1. Irrigation shall be supplied by the year. The year shall run from rabi to kharif; *i. e.*, it shall be held to commence with the watering necessary to the sowing of the rabi crop, and to end with the last watering required by the kharif crop next following.

2. Land shall be treated for irrigation in three classes:—

I. Niai, including gardens.

II. Sanwi,

III. Ekfasli.

3. The Niai lands shall be marked off permanently. No land shall be put in this class unless a liberal and permanent supply of manure can be assured to it. Usually only those lands will be so classed which adjoin and surround the village site. The cultivators will be allowed to apply Canal water to these lands every harvest, so far as water is available. For any sufficient reason any land classed as Niai may be removed again to Class II.

4. The rest of the lands of a village applying for Canal-water, will ordinarily be classed as Sanwi. It shall be an obligatory condition of the irrigation of these lands, that a year's crops (rabi and kharif) shall be followed by a

year's fallow. In every alternate year the irrigator will be at liberty to cultivate two crops, *viz.*, a rabi followed by a kharif, or to sow a high class crop such as sugarcane or cotton.

5. A cultivator irrigating land under the previous rule will be entitled to two free waterings for an equal fallow area; *viz.*, one in January after the Maghi holiday, (1st Magh = 2nd January) and one in April after the Baisakhi, (1st Baisakh = 11th April). These waterings are given to enable him to prepare land for the next year's rabi. Either watering may be refused, if the rain-fall above these dates is sufficient for ploughing. It is a condition of these free waterings, that the land shall be kept fallow till the next year's rabi is sown.

6. Upon special application, poor sandy land, as regards which it can be established that it is not suitable for Sanwi cultivation, may be classed as—

Ekfasli rabi,

or

Ekfasli kharif.

Such land will then be supplied with water for the harvest in which it is classed. It will be a condition of such irrigation that the land shall lie fallow in the other harvest.

7. If water runs short, the Niai land will have the first claim to a supply, then the Sanwi land; and the Ekfasli will be supplied last.

8. The irrigating outlets on the Rajbahas will usually be village outlets; and the system of giving outlets to individual irrigators will be avoided as far as possible.

* * * * *

Note by T. GORDON WALKER, Esq., Settlement Officer, Ludhiana, on the method of irrigation to be adopted on the Sirhind Canal, the rates to be introduced, &c.

Importance of considering the agricultural system.

1. In considering the subject of the distribution of water and the rates to be adopted on the Sirhind Canal, it appears to me to be of the first importance that we should endeavour to form some idea of the probable effect of the introduction of Canal irrigation on the systems of agriculture which we now find in the country. I am tempted to go into this matter in detail because it is the one on which, as a Revenue officer, I would naturally be expected to express an opinion, and because there is a good deal in the correspondence before me in which I cannot agree. Perhaps, too, such local knowledge as I possess, after four years as Settlement officer in the Ludhiana district, may be useful.

Proposal to maintain the two years' course prevailing in unirrigated tracts.

2. First then as to the attempt to maintain what has been called the two years' course of cultivation now prevalent in unirrigated tracts. This appears to me unadvisable. I doubt if the prevalence of the course is due to the fact that it was introduced from the sub-montane tracts where there is a higher rain-fall. At all events the evidence appears to me to show that the people abide by the system because it is adapted to the conditions of the country where it prevails. Our experience in the sandy tracts over the valley of the Sutlej is that the cultivation of a kharif immediately after a rabi is given up if it is found unsuitable.

I would further remark that the name and description of the two years' course may be misleading, especially if we consider the year as beginning with the rabi or spring harvest. The agricultural year begins *after the rabi* at the Namani (15th May). Land is rented from that date and the tenant on an annual lease counts his year from it. A rabi crop having been taken off the land the cultivator has the option of sowing the kharif immediately following or

the next rabi, both of which are in the agricultural year. *One harvest is always grown in the year.* Thus:—

	Kharif.	Rabi.		Kharif.	Rabi.
1st year ...	Charri ...	...	or	...	Gram.
2nd year ...	...	Gram ...	...	...	Gram.

There is no doubt that in the Ludhiana district with the exception of the *Bet* or lowlands and the sandy tract immediately over the course prevails in which a kharif immediately follows a rabi and two fallows succeed. But it is a great leap from this to the conclusion that such a course will be most suitable for land irrigated by the Canal. It is more natural that we should argue from the analogy of systems of irrigated cultivation in vogue in the district. Thus in Samrala tahsil there is 40 per cent. of well irrigation, and a good deal of this gets a short supply of manure or even none at all. It would be safer to argue from this irrigated than from dry cultivation.

The utmost that we could do, would be to insist on one fallow in the year in unmanured land, although I doubt if even this restriction will be necessary; for I will give reasons further on for thinking that the area irrigated by the limited supply of water allowed will probably be covered by the manure supply. There are a great many reasons that might be given for the present system of unirrigated cultivation. The people have arrived at it by empiric method; and I have no doubt that if they are left to themselves they will modify it when they find it unsuitable to the changed circumstances. I have no doubt, for example, that with the heavier fodder crops that will be raised under Canal irrigation it will not be necessary to have so large an area under "*charri*," or the cultivators might even find it more profitable to buy fodder elsewhere and devote their attention to the cultivation of the more profitable rabi crops. The chemical reasons explain in part, why the present system is found most suitable; but irrigation will completely change the condition, and it is very probable that a large area will be found bearing wheat (which has never before been grown alone) year after year.

Proposal to limit the *Niai* or twice cropped area.

3. I am in the same way opposed to any restriction of the *Niai* area. With a limit of total irrigation it should not be necessary to limit the twice cropped area. It would be distinctly injurious to mark off a certain area which should be *Niai*, unless we include in that a deal of land that is not constantly "*dofasli*," *i. e.*, bearing two of the common crops or one of sugarcane or cotton in the year. Here again our experience in the Ludhiana district should help us. In the uplands the *Niai* area is fixed because irrigation cannot be extended to a distance from the wells; but in the *Bet* or lowlands where the soil is naturally moist the *Niai* or *dofasli* area is more extended, and it is not all so constantly cropped.

The most distant or badly situated fields do not get manure; but still the area that does is very extended, and shifts from year to year. I need only refer to the assessment reports of the district recently submitted for proof of this. The manure does not cover the whole land that is or may be "*dofasli*"; and within a certain wide limit fields are manured and bear two crops or the equivalent one year, and are cropped like ordinary unmanured land the next. Such a change must be favourable to the land. I should think that in the same way, when Canal irrigation is introduced into a village, the more distant fields will continue to be cultivated as before; but the twice cropped area would be to some extent shifting. With a limited supply of water there ought not to be danger of over cropping. I do not mean to say that the "*dofasli*" area would be as moveable with Canal irrigation as with natural moisture; but I should think that it would be much more easily shifted than with well irrigation. This is a point on which the Canal department could give information.

4. Next, as to the proposal to insist on the people continuing to irrigate from wells now in use, which would be the result of forbidding Canal irrigation on land now watered from wells, there are no details in the papers which would show what the proposal amounts to.

Proposal to forbid use of Canal-water on already irrigated lands.

On the Abohar branch of the Canal, although the heads and tails of two other Rajbahas have been constructed, it is not intended, I believe, to irrigate regularly higher up than the Jagraon and Manoke Rajbahas. The former of these takes out to the north near to the town of Jagraon, and is not likely to water more than six or seven villages of this district. The Manoke Rajbaha leaves the main channel some miles higher up, and passes through 10 or 12 villages in the south-west corner of the tahsil. In the villages likely to be irrigated from these, the area now irrigated from wells is certainly not more than 8 per cent. of the total cultivation. I do not know what the plans for irrigating from the Bhatinda branch are; but I conclude that there will be little or no irrigation to the east of the Ludhiana and Maler Kotla road from it. If this is so, the existing well irrigation will be found to be of the same character as that described on the Abohar branch. The Patiala (?) branch passes through two or three outlying villages of Samrala tahsil, where water is near the surface (25 feet) and the well cultivation superior. But I leave this branch out of account. The further we go down the Canal and its branches the greater is the distance of the spring-level from the surface (it begins at about 45 feet); and the less profitable is well irrigation, till finally it ceases. I think it would be a mistake to insist on the continuance of well irrigation where it is just profitable, and would be at once abandoned on the introduction of Canal-water. In his recent orders on Ludhiana assessment report, Mr. Lyall would not allow a higher rate than Re. 1-6-0 an acre on well land in the outlying villages of the tahsil, which are not far distant from the Bhatinda branch, and 20 to 30 miles north-east of Sohna. These well lands have the best situation, being just round the site, and manure is put on them without much trouble. I do not think that we could insist on cultivation of this sort being maintained with Canal water at hand. These would generally be the very lands that would best repay cultivation with Canal-water; and the outlying lands would be cultivated with less profit.

As far as I know, then, the question does not concern superior well irrigated cultivation now in existence, but the irrigated cultivation that will be found in Canal watered villages is in small proportion and of inferior quality.

It must be remembered, too, that such land is already assessed as irrigated, and I think that the people may be safely left to decide the question of whether they should apply Canal-water to land assessed at dry rates, or to that already paying an irrigated assessment. Higher up the Canal, where the lift is not so great, and irrigated cultivation already pays Rs. 3 to 4 an acre, I do not believe that the people would put on Canal-water, and thus have to pay Rs. 5 or 6 extra. They would certainly not do so in tracts where the amount of water supplied is so limited, as it will be where such rates prevail, if irrigation is ever extended to them. I quite agree that the percentage allowed should be calculated on the unirrigated cultivation, the well lands being excluded from both sides of the account.

5. I think then that the only interference to be exercised is in the direction of limiting the supply of water. I do not think, for instance, that any of the Jagraon villages should have more than a 20 per cent. allowance. In the uplands of Samrala 40 per cent. of the cultivation is irrigated from wells. In the Pawadh circle of Ludhiana 30 per cent., and in the Upper Dhaia of the same tahsil 25 per cent. A very large proportion of this is manured, and bears two crops or the equivalent in the year; but the soil does not deteriorate. The irrigated area in the first zone will be from 20 to 30 per cent., between wells and Canal, probably about 25; and I have no doubt that there is sufficient manure to cover this, so that if the cultivators exercise the same foresight in regard to Canal-water as those of other parts do in regard to well cultivation, I can see no reason why the land should deteriorate. On the contrary, there is the advantage already noticed that *dofasli* area can be shifted about with Canal-water more than with wells. I

Limit in the amount of water supplied the safest check.

believe that the experience gained on the Bari Doab Canal is opposed to these anticipations, but I do not know that the conditions are the same on both Canals. I am under the impression that deterioration of soil along the Bari Doab Canal is to be ascribed to an excessive supply of water, more land being irrigated than could be covered by the manure. There may be something demoralizing in the use of Canal-water; but I cannot believe that the abundant supply of manure to be found in most villages will be totally neglected by the people. I do not under-rate the danger of over-cropping land; and I think that the effects of the irrigation should be very carefully watched, and that the right of interference in these matters should be reserved. A rule might be introduced, if necessary, that not more than 10 or 15 per cent. of the cultivated area should bear two crops, or the equivalent in the year.

I am not sure how it is intended to work the 20 or 30 per cent. limit of irrigation. Is it intended that this proportion of the land should be marked off at the beginning of the year, and that no irrigation outside of it be allowed? The result of a restriction of this nature would be to make the cultivators take two crops in the year off as much as possible of the irrigated area, and this is to be avoided.

. Is a supply of water guaranteed for the area marked off *for both harvests*? Is the area of a field that bears two crops with irrigation in the year counted once or twice? It would be better if the allowance were, instead of 20 per cent. for the whole year, 15 per cent. of the area in each harvest. The cultivators might or might not take two crops in the year out of 10 per cent. of the cultivation. They would certainly not take two crops in succession out of the whole irrigated area unless forced to do so.

6. It occurs to me to say with reference to the limit in the supply of water that it should be applied to regularly irrigated fields. A single watering for ploughing or sowing taken expressly for this purpose would not, I conclude, be counted in the percentage of area allowed.

Exclusion of area watered for ploughing.

7. I do not feel in a position to offer any suggestions as to the method of distribution, because I have no practical experience to guide me on this point. The chief objects to be attained appear to me to be these, that every village should have a separate opening, and that the proprietor should be allowed to arrange the internal distribution of the water. I do not fear that any class of middle men such as appear to have come in on the Bari Doab, will spring up; but I think that such a class should not be recognized if it does.

Method of distributing the water.

The village will require assistance in arranging the distribution and without a thorough knowledge of the tenures and the distribution of the land no officer could give any real assistance. I hope I will be excused for saying that I do not think that any one but a revenue officer who has seen settlement work and has a minute acquaintance with settlement records could in the first instance give the assistance. It would probably be necessary to have a record of rights in irrigation; but the time for making this out would be some years hence when things had settled down. With the rights once defined and a proper distribution originally made all would go smoothly.

The rates; feasibility of soil rates. 8. I would next refer to the proposed rates.

It is probable that the Canal department would welcome any attempt to simplify the system of crop rates with its necessary opportunities for mal-practices of subordinates, and it would undoubtedly be an advantage to have a system of rates similar to that of our assessments. But any proposal in this direction is liable to the objection that it would necessitate a fixture of the irrigated area and of the higher cultivation, which may take place; but which we ought to discourage as opposed to good husbandry. If the Niai area be fixed according to the proposal of the Settlement Commissioner, his system of rates would be applicable, but I have already expressed an opinion that to do this would be contrary to sound principles of agriculture; and that the cultivator

should be allowed and encouraged to shift as much as possible the heavily cropped area so as to avoid exhaustion.

Thus although I have the greatest aversion to fluctuating assessments based on annual measurements where there is no danger of failure of harvest, I am compelled to express an opinion against any soil rate assessments.

Owners and occupier's rates.

9. It appears to me unnecessary to consider the question of owners and occupier's rates. This refinement seems to me particularly inapplicable to the tracts likely to be irrigated by the Abohar and Bhatinda branches of the Canal, where the cultivation is almost entirely by proprietors. A numerous class of tenants will of course arise, for the present agricultural population could never carry on the cultivation under the new conditions; but the tenants will come after the irrigation, and there will be no pre-established relation between them and the proprietors. The rates that I will consider are consolidated rates (including owners and occupier's) and *far flow*.

Necessity of considering the crops now grown in the tracts.

10. The rates must of course be founded on the value of the crops that will be grown and the rates of rent that will be paid, or the profit of the cultivating proprietor, and I would remark that any rates now introduced ought to be clearly recognized as tentative, and liable to complete reconsideration five or ten years hence when the irrigation of the Canal and the new system of agriculture have developed. As deficiencies come to light they should at once be remedied, but the whole system should be revised by the revenue authorities say ten years hence, when information is available. I will first briefly describe the present system of agriculture and the crops grown in the country likely to be irrigated by the Canal. In irrigated land which gets a good supply of manure, a kharif crop of maize is immediately followed by a rabi of wheat, or more rarely, of barley. Where there is little or no manure, a single crop, generally of wheat, is grown. There are stray crops of carrots, &c., but these occupy a trifling area. I have already referred to the well cultivation in para. 4. No cotton is, as far as I know, likely to be found in the village that will be irrigated from the Abohar and Bhatinda branches. In some places on outlying wells the system of cultivation is this, the area on one side of the well is cultivated as irrigated land for a year, while that on the other is unirrigated; and the irrigation is thus shifted annually. This method is noteworthy with reference to the previous remarks about shifting the irrigated area.

The unirrigated crops are in the rabi wheat or barley sown mixed with gram and with sarson sown in furrows at regular intervals (this crop is called "berra"), and in the kharif pulses (moth, mung, &c.) or a mixture of these with charri, jowar or bajra.

Value of crops grown on other Canals and in other parts of this district.

11. In endeavouring to form an idea of what crops will be grown with Canal irrigation and what their value, we may reason either from the results of the extension of Canal irrigation in other parts, or from the cultivation of other highly cultivated parts of this district. My acquaintance is with the latter source of information.

The people will not invent anything for themselves, but will look, at all events in the first instance, to other parts of this country for staples and method of cultivation. I think that with an Agricultural department in working order the opportunity would be such a one as is rarely offered for preventing cultivation from running into unhealthy grooves, and much might be done in the way of directing the new agriculture.

Probable effects of the Canal on the agriculture, and the introduction of new staples.

12. In the villages where there is already irrigated cultivation (from wells), the immediate result of the introduction of Canal-water is likely to be the extension of the existing system of irrigated cultivation. Maize followed by wheat or barley will be grown where manure is available for a single crop of wheat, &c. The people further down the Canal will look to their neighbours for new staples and the methods of cultivating them and will also

begin with maize and wheat. The cultivation of cotton and of sugarcane will probably follow. No rice is grown within a very great distance, and I should doubt if it would be introduced, as the soil appears to me too light for it (I speak of this district). There will also be crops of less importance because covering small areas—indigo, vegetables, poppies, &c., which may or may not be introduced. These will be the crops in the higher cultivation.

Where the Canal-water is used simply to protect the staples now grown in unirrigated lands, to what extent it will be so used with a limited supply of water remains to be seen: the crops grown in the rabi will be wheat or gram alone or mixed, or barley alone. Barley and gram, which is now only grown where the rain-fall is very scanty, because the crop is a hardy one will probably be given up. In the kharif the inferior crops will probably remain as before, except that jowar and bajra will be grown more and charri or mere fodder less; that is, the people will look to their fodder crops for a certain return of grain. It may be said that these are mere guesses, and so they are; but the rates now proposed are so too. I should be prepared to find that this forecast was quite wrong, but the rates that I would suggest are founded on them, and I have therefore given the details.

Relative value of the new crops likely to be introduced.

13. For sugarcane, maize and cotton, we have cash rents *on the crop* (zabti) prevailing in other parts of the district. Sugarcane is the best crop. It occupies the land for three harvests or one and half years; and the rent is (for the crop, not the year) from Rs. 12 to Rs. 15 an acre. *Maize* is certainly in this district the second of the great crops in value. The cultivation is very careful and the land is thoroughly manured for it. The yield is heavier than that of any other crop. The chief value of the crop lies in this, that it supplies a much greater weight of food for man and cattle than any other crop.

The crop is not in the ground for more than three to four months. The rent rate on the crop is Rs. 10 an acre, but the cultivator has generally for this the use of the land for the rabi immediately following.

Cotton is slightly inferior to maize in value as now cultivated. The rent is from Rs. 7-8-0 to Rs. 9 an acre. Both maize and cotton may be followed by a crop of wheat or barley.

For irrigated wheat a cash rent is not paid, but it is inferior to the three preceding crops, especially when it immediately follows a kharif, as it does and will do in a considerable proportion of the irrigated area.

Rates of land revenue assessment now prevailing in the tracts.

14. In determining the rates for irrigation, I do not know that any general standard such as the half-rent one has been laid down. The rates of revenue assessment which the land likely to be irrigated will be found paying are on the Abohar branch and the upper part of the Bhatinda branch roughly, irrigated Rs. 3, unirrigated Re. 1, an acre, but the irrigation is in small proportion. In the detached villages of the district which lie on the Bhatinda Branch (above Sahwa and to the south) there is no irrigation, and the unirrigated rate will be from 8 annas to 10 annas an acre. The rate that will be found to prevail in the Ferozepore villages through which the Abohar branch passes will vary from 12 annas to 8 annas on unirrigated land. These rates must be an element of great importance in fixing the Canal rates. These latter will be applied for the most part to land paying at unirrgated revenue rates; and, with reference to the proposal to prohibit the use of Canal-water on already irrigated land, we ought, I think, to go on the assumption that they will in all cases be so applied.

The remarks made by Mr. Preston in paragraphs 1—5 of his letter with these papers appear to me to be deserving of attention; but here we have to devise rates which will apply to land, the revenue assessment of which varies in this district from 8 annas to Re. 1 an acre, and is everywhere, as far as I know, within Re. 1 in British territory.

15. I have fixed the rates in all cases so that they fit into the kacha or local biga which has been decided on for this district. The biga is $\frac{5}{24}$ of an acre and the proportion of rates are as below :—

Proposed rates for the Canal.

Per acre.			Per kacha biga.		
Rs.	A.	P.	Rs.	A.	P.
1	8	0	0	5	0
0	12	0	0	2	6
0	6	0	0	1	3

so that we must work on multiples of 6 annas in the rates per acre. I do not think that it will be necessary to go lower than $\frac{1}{4}$ of a kacha biga; and I would have the calculation in quarters of this measure.

The rates that I would propose are—

Class I.—*Sugar-cane*—

Rs. A. P.
6 12 0 an acre.
1 6 6 a Government kacha biga.

I think that we may go as high as this without difficulty ; and that the cultivation of the crop will be introduced even with this high rate. But I would, for the present, have no other crop in this class. When the cultivation has established itself, the extra 12 annas an acre to make up the rate fixed by Colonel Home might be added. On the other hand, if the crop is not grown with this rate, 12 annas might be taken off. We must always bear in mind that these higher crops are quite new to the country, and that the people will require encouragement to start them—

Class II.—*Maize and cotton*—

Rs. A. P.
4 8 0 an acre.
0 15 0 a Government kacha biga.

If the cultivator follows these with a rabi, I would charge him half the rabi rate for the crop. To charge nothing might be dangerous as encouraging over cropping.

Class III.—*Wheat, indigo and other dyes, tobacco, melons, vegetables, gardens, sarson, tara mira, barley, wheat and gram (mixed with sarson)*—

Rs. A. P.
3 6 0 an acre.
0 11 3 a Government kacha biga.

Here again I have put indigo in an inferior class, with a view of encouraging its introduction. It could be raised to Class II. at any time.

Tobacco, vegetables and melons are all in a sense catch crops. They are often taken between a rabi and a kharif ; or else after a crop of maize, the rabi being omitted. They are not more than two months in the grounds. I suppose that the high rates charged elsewhere are for vegetable gardens, land on which a succession of crops is raised.

Class IV.—*All kharif crops not specified above ; and of the rabi, gram, barley and gram (with sarson)*—

Rs. A. P.
3 0 0 an acre.
0 10 0 a Government kacha biga.

Clsss V.—*Single watering before ploughing for fallow lands*—

Rs. A. P.
0 12 0 an acre.
0 2 6 a kacha biga.

Class VI.—*Single watering for sowing ; if the crop get no further watering from the canal*—

Rs. A. P.
1 8 0 an acre.
0 5 0 a kacha biga.

I am not sure that these rates for V. and VI. are not, even as reduced by me, too high. Those in the papers appear much too severe.

I would repeat that any rates we now introduce must be subject to revision. I do not know that the same problem has ever come up in these parts, namely, what rates should be adopted on the introduction of Canal-water into a tract where agriculture is of such a primeval character.

Lift rates.

16. I have no knowledge of what the height of the lift will be, or what proportion of lift to flow rates would be suitable ; but Rs. 3 and 4 would best fit in with the local biga rates.

17. I must apologize for the length of this note : but the subject appears to be of sufficient importance to justify my going into these details, and perhaps they may have thrown some light on the subject.

Note by J. Wilson, Esquire, Settlement Officer, Sirsa, on the distribution of water and mode of assessment on the Sirhind Canal.—Financial Commissioner's No. 388S., dated 17th April 1882, to Government Punjab.

Experience of Canal irrigation.

My experience of Canal irrigation is not great. I saw something of irrigation on the Western Jumna Canal when Assistant Commissioner in Rohtak for a year and when Assistant Settlement officer in Delhi for four months, and on the Agra Canal when Assistant Settlement officer in Gurgaon for a year and-a-half. I had no occasion to enquire particularly into the method of distributing the water, but I had at times to check accounts connected with the imposition of the rates.

I.—Method of distributing the water.

Maximum irrigation allowable to be fixed for each village.

2. In order to prevent excessive irrigation it is necessary to limit the amount of water to be supplied to each village. At present it does not seem practicable to actually measure the volume of water supplied, and the next best check is to limit the area which can be irrigated in any one year. The evils of over irrigation are much greater near the head of the Canal where the spring level is near the surface than near the tail where the spring level is more than 100 feet below the surface, and there is no danger of the soil becoming water-logged. It is therefore advisable to establish a proportion varying for each village separately beyond which irrigation would not be allowed. This distinction might be made by dividing the villages along the Canal into belts, in which the proportion fixed would be 20, 25 and 30 per cent. respectively. In estimating the proportion, the whole area of the village cultivated and culturable would be taken into account. I would not exclude the area irrigated from wells, and would not prohibit Canal irrigation of that area. To do so would be hard on the man who had, before the introduction of the Canal, shown most enterprise and expended most capital in sinking wells on his property, and would in some villages prevent the irrigation of the best land. It would also be unjust to the villages which had done most to develop well irrigation. It is no doubt desirable to discourage the substitution of Canal irrigation for well irrigation where that is already practised, but it would be sufficient discouragement if the Canal rates were pitched high and if no favor were shown to lands already highly assessed as subject to irrigation from wells.

Distribution of water to be left to the villagers.

3. Having fixed the maximum area to be irrigated in the village and marked out on the map the boundaries of the area which is within reach of Canal-water, and the best line for the village water-courses, the Canal officer would call the villagers together and explain to them the arrangements possible. Each village should have its separate head or heads, and it should primarily be the duty of the Canal

officer only to regulate the supply to the heads. The construction of the water-courses and the distribution of the water might in the first instance be left almost entirely to the village itself, the Canal officer being ready with his advice, and interfering only where the line of water-course adopted was manifestly injudicious, or where some dispute arose which the villagers could not settle themselves. As in our revenue system the Canal officer should deal with the village as a body, leaving the internal arrangements to be carried out by the villagers themselves, as it is impossible for him to know the wants of the village and the relations of the mutual interests involved so well as they do. He should assist with his advice and record the arrangement finally agreed to, deciding any dispute that arose. He might find it necessary to look after the interest of the weaker members of the community, especially the occupancy tenants, who, as having permanent rights in the land, should have a voice in the distribution of the Canal-water; it would be useless to give tenants-at-will of the land anything like a permanent right to the water. We have in this district on the Ghaggar a number of villages which have without help arranged for the distribution of the water available for irrigating purposes from the varying Ghaggar floods. Each village has its separate water-course or water-courses, and divides the water as it divides its land or land revenue, by a *pattidari* system or *bhayachara* system or a mixture of the two. For instance in one village the water is taken by each patti and by each owner in the patti for a time proportioned to his share in the village. In another each owner and tenant takes water for a time proportioned to the area of rice crop he has sown. The distribution is superintended by responsible members of the village community with the help of a water clock to estimate the time. Hitherto no dispute regarding the distribution of the water has come into court; they have themselves settled all disputes. Indeed until this settlement no record of the rights of individuals to water has been made. I have little doubt that the village organisation on the line of the Sirhind Canal has a similar capacity for adapting itself to the new conditions.

Interference with internal distribution undesirable.

4. I do not think it desirable to interfere with the internal distribution of the water to such an extent as Major Wace advocates. The vast difference made in the conditions of cultivation by the substitution of a permanent water-supply from the Canal for a varying rain-fall, must necessarily change materially the system of cultivation, and our knowledge of the best methods of cultivation is not sufficient to justify our endeavouring artificially to encourage one method and discourage another. Such interference with internal details as would be necessitated by Major Wace's system would involve a great increase in the work of the Canal officers in the number of disputes they would have to decide, and in the power of their subordinates. If we provide against the evils of over irrigation by limiting the area to be irrigated annually we do all that is necessary or justifiable. Each village will find out for itself which is the best method of applying the water, and if it does make mistakes at first the evil and loss will not be great. If the Canal officer were to interfere with details, except where dispute arises, he would be likely to make greater mistakes and cause more loss to the villagers than they would if left to themselves. It was the faulty system of assessment that caused all those evils on the Western Jumna Canal, and not the will of the villagers themselves; and now that the details of irrigation are to a certain extent left to their own option, they show how thoroughly they have learned the lessons of experience.

II.—Method of Assessment.

Land revenue to be assessed without reference to the Canal.

5. As regard the method of assessment, it seems clear that the Settlement officer in assessing the land revenue of the villages within reach of Canal irrigation should assess them as they would be assessed on the supposition that they took no water from the Canal. This has been done in Sirsa, and is being done in Ludhiana. In that case both Canal officer and villager are free to act as they like. The Canal officer offers the water to the villager at what price he thinks fair; if the villager thinks it will pay him to take the water at the price offered, he will take it; if not he will refuse and no harm is done; he can go on cultivating as if the Canal were not there and will pay only what he would pay without the Canal. The

Canal officer can, without injustice stop the supply of water to a village for any good reason and is left unhampered in his management of the Canal. If the approach of the canal causes wells to fall in, which were at settlement assessed as in use, compensation should, in common fairness, be given in the shape of a reduction of land revenue; or rather the whole village should be re-assessed under the new conditions which were not contemplated at settlement. Ordinarily a redistribution of the land revenue of the village without any reduction of its amounts would be all that would be required.

Rates should vary with the value of the water.

6. If the land revenue assessment were made in this way there would be no danger in the monopoly. In any case the monopoly would be in the hands of Government which is supposed to endeavour to use its power justly. As well object to the monopoly of the right of levying customs and excise duties. An intelligent and just monopolist is a better master than a blind unreasoning system. The Canal department who represent a Company, the shareholders of which are the whole Indian people, should endeavour to do their best in the interest of their shareholders without injustice to their customers, the irrigating villagers. They should be guided by the same principles as would guide an honorable commercial company, and should endeavour to make as much profit as they fairly can out of the sale of their water. If they sell their water at too low a price to A., whose land happens to be on the Canal, B. whose land is out of its reach, or C., who has no land at all, might fairly object that his interests as a tax-payer were not being properly consulted. An adjustment of prices such that the price of the water given will be fairly proportionate, on the one hand to the cost of the water, and on the other to its value to the irrigator, will not only be fairest to the tax-payers generally but will be the fairest possible adjustment of the rights of the irrigators among themselves. A cubic foot of water costs much less at the Canal head than a cubic foot at the tail, and a supply of water in the sub-montane districts with their good and certain rain-fall and spring level near the surface, is much less valuable to the cultivator than a similar volume would be in the Sirsa district where the opposite conditions prevail. It would be wrong commercially and unjust to charge the same for the water near the head as at the tail. The cost of the water must increase in some proportion to the distance from the head, and as it happens the amount of rain-fall diminishes and its uncertainty increases with the distance from the hills, *i. e.*, with the distance from the Canal head. From both points of view then, that of cost to the producer and value to the consumer, it ought not to be difficult to fix a scale of rates varying in some proportion to the distance of the irrigated land from the head of the Canal, which would fairly represent the cost and value of the water supplied to each village. I do not see why each village or each tract or belt should not have a separate scale of rates. If the village thought the rates offered it too high it would refuse the water and no harm would be done. If the Canal department found its water left unconsumed it would reduce its rates until it was worth the whole of the villagers to take it. Of course in any case (unless by some means or some method of assessment, such as was employed on the Western Jumna Canal, the water is forced on the villagers), it would be necessary to offer the water at such a price as would leave a small margin of profit to the cultivator, but it would be wrong and unfair to leave too great a margin. If the profit thus left were shown to be too great by a considerable rise of rents traceable to this cause, the Canal department should, by raising the price of its water, appropriate its fair share of the profit, as any commercial body of producers would do.

Distribution of assessment to be left to the villagers.

7. Within the village there will still be a similar inequality. Some land from its position or the quality of its soil derives greater benefit from the Canal irrigation than other land in the village. It would be unfair to charge it at the same rate. This difficulty I would meet in the same way as we do similar difficulties in distributing the land revenue assessment. We divide the lands of the village somewhat roughly and arbitrarily into classes according to their position and soils, apply rates to those classes, and announce the total assessment so obtained as the assessment of the village. This we leave to the villagers themselves to distribute. Often they distribute it in shares or by an all-round rate on land or

by some other method which their knowledge of their own interests has shown to be the fairest. It is but seldom that they apply to the Settlement officer for a distribution on soil such as that by which he estimated the amount to be assessed on the village as a whole. Why not apply the same system to Canal assessment? The Canal officer would measure up at each harvest the area irrigated, would apply to that area the rates fixed for the village as the price of the water, and would announce the total sum as the amount to be paid by the village as a whole as the price of their Canal-water. The Canal officer having fixed the total amount to be paid, its distribution might well be left to the Deputy Commissioner. The villagers would be called up in a body and asked how they would distribute this demand. I have no doubt that, especially at first, they would be able with a little help to agree to a fair method of distribution or would agree to fix it by arbitration, and that it would only be in rare cases that the method would have to be fixed by order. If no agreement could be come to, there would always be the Canal officer's method of assessment to fall back on, and no doubt that would be quite as fair a distribution of the Canal assessment as is the distribution of the land revenue assessment by the Settlement officer's assessment rates, on which he has sometimes to fall back when the villagers will not agree to any other method of distribution.

Revision of Canal rates from time to time.

8. The village rates for Canal-water would, like the Settlement officer's village assessment rates, be only approximate and would have to be revised and re-adjusted from time to time. This need not be often done, any more than the revision of land revenue assessment. In assessing the land revenue, especially before the experience of former assessments is available, the Settlement officer often makes serious mistakes. He assesses a village too low and for the term of settlement the proprietors reap an undue profit; at re-assessment the demand is raised. The same thing would happen on the Canal; some villages would be given too low rates, they would reap for a time an undue profit; at revision of Canal rates the rates for those villages would be raised. Government can afford to wait for this. One advantage the Canal officer would have over the Settlement officer: if the latter made a mistake the other way and assessed the village too high, the mistake was only found out when the people absconded or sold and mortgaged their lands. If the Canal officer fixes his village rates too high, the villagers will simply refuse to take the water and no harm is done. Just as Government during the currency of a land revenue settlement never raises its demand, but sometimes lowers it for good reason, so the Canal officer would never raise his village rates during the period fixed, but would, where he was satisfied by the refusal of the villagers or some other good reason that his rates were pitched too high, reduce them to whatever seemed fair. The village Canal rates first fixed would be tentative and would like a summary assessment of the land revenue be fixed for a short term, say for three years. As experience was gained they would be fixed for longer and longer terms and would ultimately be revised along with the land revenue assessment and fixed for the same period.

No owner's rate required.

9. Under this system there would be no such thing as an owner's rate. An owner's rate is simply an expedient for imparting a fluctuating element to the price exacted for Canal-water, and for adopting the charge made to the varying value of the water supplied. When the owner's rate is made to fluctuate exactly in proportion to the occupier's rate it becomes an absurdity, and when cesses are charged on it, a monstrosity. Nothing can be more irritating to a zamindar than to have charge after charge and cess after cess imposed on his land, and nothing is more unnecessary. One price should be charged for the water, and if it be thought expedient (and it seems fair enough) that the local rates should benefit from the introduction of Canal irrigation, a fair proportion of the gross Canal revenue should be credited to local rates at head-quarters; it is quite unnecessary to calculate out the proportion for every cultivator's holding.

Other expedients unsatisfactory.

10. If the same rates be charged for water throughout the Canal, it is only fair and expedient in the interests of the tax-payer to establish some system by which a share of the large profits which must in that case fall into the hands of those

whose lands are most favourably situated may be appropriated by the State. Here again the fairest plan would be to charge each village at separate rates calculated according to the varying degree of benefit it derived from its position; the villages least favourably situated being charged no owner's rate assessment at all. Or an assessment of the benefits derived from position might be made and revised from time to time as proposed by Mr. Lyall. But there would be some difficulty in distributing this demand and these expedients are, at the best, evasions and complications, and it is much simpler and better to charge one price for the water assessed at rates fixed for each village according to its position. It would be just as easy to make a village-to-village assessment of Canal rates as it is to make a land revenue assessment by villages. Indeed it would be easier, after some experience had been gained, for a simple refusal of a village to take up water if long sustained should show that the Canal rates had been assessed too high; and an unduly great rise in the rent of Canal irrigated land as compared with unirrigated land would show that the rates had been pitched unduly low.

Proposed system briefly described.

11. Briefly then I would fix the maximum area to be irrigated in each village annually; would supply the necessary volume of water to the villages as a body; and would leave them to distribute it over the land as they thought best, recording the arrangement to which they came among themselves. I would, to begin with, have the same rates throughout the Canal and pitch them low in order to develope irrigation rapidly, but would give the people clearly to understand that after three years an assessment would be made and separate rates fixed for each village according to its position and advantages with reference to Canal irrigation. This assessment I would revise five years after and announce for ten years; at the next revision the rate would be fixed for the remainder of the term of settlement and would thereafter be revised along with each revision of land revenue assessment. The Canal officer would measure up each harvest the area irrigated, apply the village rates and announce the total demand for the village as one sum. This would be distributed among themselves by the villagers under the direction of the revenue authorities and realized accordingly.

Advantages of proposed system.

12. Such a system would, by a self-adjusting process, secure to the Canal department the full value of the water supplied while leaving a fair profit and no more to each irrigator. It would reduce the work of the Canal officers and lessen the opportunities for extortion of the Canal subordinates. It would fall in with our land revenue system and would be understood by the people to whom would be left the management of the details which no one can know so well as themselves.

No. $\frac{51}{1050}$, dated Lahore, 16th August 1883.

From—H. C. Fanshawe, Esquire, Officiating Junior Secretary to Government, Punjab,
To—The Secretary to Financial Commissioner, Punjab.

I am directed by the Lieutenant-Governor to acknowledge the receipt of your letter No. 1267, dated 5th December last, regarding the arrangements for the distribution of water, and (more particularly) the amounts of the Canal rates on the new Sirhind Canal. I am to express regret that, owing to the difficulty and importance of the subject, this reference has remained so long unanswered.

2. It appears from your 2nd paragraph that Mr. Lyall concurs in the view stated by Lieutenant-Colonel Wace in paragraph 3 of his letter No. 245, dated 2nd September 1882, to the effect that the rule restricting irrigation to a certain proportion of the village area should not be too rigidly worked, especially at first starting. Colonel Wace's opinion is practically the same as that given in paragraph 7 of this office memorandum No. 69, dated 28th September 1882, to the address of the Joint-Secretary to Government, Department Public Works, Irrigation Branch. Colonel Home has since explained in his letter No. 4020, dated 14th November 1882, that the varying circumstances

which ought to determine the allotment of water will be duly considered in making it, and that the size of the channels will regulate the maximum supply, which can only be increased on some lands if the full amount available is not taken on others. The register suggested by Lieutenant-Colonel Wace is kept up by the Canal department.

3. With regard to the remarks in Lieutenant-Colonel Wace's 4th paragraph on the proposal to prohibit the application of Canal-water to lands irrigated from wells, (orininally made in paragraph 22 of Colonel Home's note printed with the case), I am to say that the question has been practically disposed of by paragraph 8 of the office memorandum, and paragraph 5 of Colonel Home's reply cited above. If an occupier's rate, without an owner's rate, is charged in the first instance, then Section 39 of the Canal Act, which declares that no owner's rate shall be chargeable either on the owner or occupier of land temporarily assessed to pay land revenue at irrigation rates during the currency of such assessment, will not apply. If Canal-water is taken for lands now irrigated by wells, the full price of the water will be paid, and the objection of the Irrigation department to the supply of such water to such lands, on the ground of the loss of revenue thereby occasioned, will be removed. If an owner's rate is eventually charged, then Section 39 of the Canal Act will become applicable; and the Financial Commissioner's proposal to credit the Canal department with the remitted owner's rate will be adopted.

4. The main question now for consideration is the amount of the rates to be charged for the various classes of crops. Before settling these rates, it is necessary to come to a conclusion whether there shall be an owner's and an occupier's rate or an occupier's rate only. The Lieutenant-Governor considers that the views expressed in paragraph 6 of your letter are sound. Mr. J. B. Lyall, in his note printed in the Proceedings of December 1879, No. 9A., has given convincing reasons for beginning with a single rate in the case of a new Canal. Eventually, if the increase of rent of Canal irrigated land, due to Canal irrigation, is found to be so great that it would be worth while for the Government to claim a share in it, the desirability of imposing an owner's rate can be considered.

5. Accepting, then, the proposal almost unanimously made to begin on the Sirhind Canal with a full occupier's rate, the Lieutenant-Governor observes that there are strong reasons in the commencement of Canal irrigation to incline to fairly high water-rates. The charge being made according to crop, the people are free to take water or not as they please. Fairly high rates prevent an undue demand for the water, and tend to facilitate its distribution according to zones of varying rain supply and the circumstances of villages. Moreover, experience in the North-Western Provinces has shown that there is great difficulty in enhancing water-rates during the currency of a term of settlement after the conditions of agriculture and the relations between landlord and tenant have adapted themselves to the charges made. There would never be any difficulty in lowering the rates, if they were found by experience to discourage the cultivation of particular staples or to interfere with the water supply really required by the circumstances of the country.

6. The Lieutenant-Governor will now discuss the rate proposed for each class of crop consecutively.

CLASS I.—*Sugarcane, rice, water-nuts.*—The rate proposed by Colonel Home is Rs. 7-8-0 per acre, which the Financial Commissioner would reduce to Rs. 6-12-0. The rates for rice and water-nuts (which will probably be grown but little, if at all, in the tract watered by the Sirhind Canal) will follow that for sugarcane. The reason for the reduction is that the cost of cultivation is high. But this argument cuts both ways, because the water-rate forms only a small part of the whole cost. It is, no doubt, desirable to encourage the cultivation of this staple; but upon a new soil, not impoverished by over cropping or over irrigation, there is probably no reason to charge less than on old Canals. The rate paid on the Western Jumna Canal is the same as that now proposed by Colonel Home, and the rate on the Bari Doab varies from Rs. 7-8-0 to Rs. 6-4-0. The Agra Canal rate for sugarcane is nearly Rs. 9, and it is stated that the area under cane is increasing in the North-Western Provinces

where this rate is in force. In the Meerut district (where the land assessment is said to be full and the Ganges Canal rates, which are lower than the Agra Canal rates, are in force), application has been made to have the rates raised. On the whole, the Lieutenant-Governor would adopt Rs. 7-8-0 per acre, as the rate for crops of the first class. As already stated, it will be easy hereafter to reduce this rate if experience shows that it is unsuitable.

7. CLASS II.—*Indigo, tobacco, poppies, vegetables, gardens, orchards, maize.*—The Financial Commissioner proposes a rate of Rs. 3-14-2, and the Irrigation department Rs. 4-8-0 per acre. The reason for making the reduction in the case of maize, tobacco, opium and vegetables, is that the higher charge may encroach on the returns due to industry and manure. Colonel Wace advocates the low rate of Rs. 3 for orchards and gardens, on the ground that it is desirable to encourage arboriculture in a country now bare of trees. In the case of gardens and orchards, the rate proposed by Colonel Home is less than that now in force on the Agra Canal, where it is Rs. 5-5-0, and on the Bari Doab Canal, where it varies according to the water advantage rate, from Rs. 6-4-0 to Rs. 5-8-0 per acre per crop. Experience in the North-Western Provinces would apparently support a rate of at least Rs. 4 on indigo, even when an owner's rate is levied in addition. As regards the other crops, the area sown is likely to be small, and in view of the general considerations already stated, the Lieutenant-Governor is prepared to agree to the higher rate proposed by the Irrigation department.

8. CLASS III.—*Cotton, fibres, dyes, (other than indigo), rabi crops, (except gram and masur).*—Colonel Home's rate is Rs. 3-12-0, and that proposed by the Financial Commissioner Rs. 3-4-8, (excluding cotton, for which he would charge Rs. 3-14-2 in the 2nd class). The lower rate suggested by the Financial Commissioner appears to have been necessitated in part by the diminished rate which he has proposed for the higher classes, each being thus brought into fair proportion with the other; and in part by the desire to adjust the rate, without fractions, to the local *bigas* and *ghumaos* of the country. On the Bari Doab Canal the actual combined charge of water rate and water advantage rate varies from Rs. 3-4-0 to Rs. 4-0-0, the lower rate being due to the low assessment of water advantage rate, *viz.*, 12 annas. On the Western Jumna Canal the rate is Rs. 3-6-0, and is acknowledged to be low, whilst on the Agra Canal it is Rs. 4. Here again the Lieutenant-Governor accepts the rate and classification proposed by Colonel Home.

9. CLASS IV.—*All kharif crops not specified above, and gram and masur.*—The Financial Commissioner would increase Colonel Home's rate of Rs. 2-10-0 to Rs. 2-11-2, in order to make the rate per acre coincide with a nine anna rate for the local *biga*. On the other hand, the Canal accounts will be made up by the acre, and it is inconvenient to have pies in the acreage charge. The cultivators would doubtless rather pay 8 annas 6 pie, than 6 pie more, merely for the purpose of simplification. The reason for enhancing Colonel Home's rate thus seems hardly sufficient, and the original proposal of Rs. 2-10-0 may stand.

10. CLASSES V and VI.—Comprising the rates for—

(1).—A single watering for ploughing fallow;

(2).—A single watering for ploughing to sow;

may be considered together. The Lieutenant-Governor was, in the first instance, disposed to doubt the expediency of doubling the charge for a single watering when the watering is followed by a crop. In view, however, of the desirability of encouraging fallows, he will except the rate of 12 annas proposed by the Financial Commissioner for Class V. It is understood that the Irrigation department agrees to this rate. In the case of a single watering when a crop is sown, the choice lies between Colonel Home's rate of Rs. 2-4-0, and the Financial Commissioner's rate of Rs. 1-8-0. The price of a single watering for fallow having been fixed at 12 annas, the Lieutenant-Governor does not think that the rate should be more than doubled if the area is sown. He, therefore, agrees to the Financial Commissioner's proposal.

11. To sum up, the rents sanctioned will stand as shown below :—

Class.	Crops.	Rate per acre.		
		Rs.	A.	P.
I.	Sugarcane, rice, water-nuts	7	8	0
II.	Gardens, orchards, tobacco, poppies, vegetables, indigo, maize	4	8	0
III.	Cotton, fibres, all dyes (except indigo), all rabi crops (except gram and masur) ...	3	12	0
IV.	All kharif crops not specified above, and rabi crops of gram and masur ...	2	10	0
V.	Single watering before ploughing for fallow lands	0	12	0
VI.	Single watering for ploughing to sow	1	8	0

12. The above rates are for flow irrigation. As regards irrigation by lift, the question practically is whether the rates shall be two-thirds of the full rates as proposed by Colonel Home, or one-half of such rates as on the Bari Doab Canal. It is believed that lift irrigation is likely to be rare on the Sirhind Canal, and that when used, the use will be small. But the experience which is necessary to decide this question has yet to be gained. The decision would hinge on the actual cost of lifting the water in the first place, and this cost again depends on the height the water will have to be lifted, and on the amount of labour that will be available in the tracts where lift irrigation is likey to prevail. The Lieutenant-Governor thinks that this point may be reserved for future decision.

13. To the proposal made in your 7th paragraph. *viz.*, that the privilege of half rates shall be allowed for the next two years after water is first offered to a village, the Lieutenant-Governor agrees.

14. On the subject of the proposed deputation of a Settlement officer to assist in the distribution of water, the Lieutenant-Governor has nothing to add to the remarks of the Financial Commissioner contained in your 8th paragraph. The Irrigation Department will ask for the services of a Settlement officer or of a Settlement Superintendent if required.

15. The conclusion of Mr. Lyall that there must be a separate staff of Canal patwaris who will also perform the work of Canal patrols is accepted.

No. $\frac{52}{1051}$, dated 16th August 1883.

Copy, with copy of the letter to which it is a reply, forwarded to the Joint-Secretary, Department Public Works, Irrigation Branch, for information, in continuation of this office No. 84, dated 27th November 1882.

SECTION III.

INUNDATION CANALS—GENERAL.

A.

Papers as to the General Nature and History of Inundation Canals in the Punjab.

No. 834, dated Lahore, 17th August 1882.

From—F. C. Channing, Esquire, Senior Secretary to Financial Commissioner, Punjab,
To—The Secretary to Government, Punjab.

In paragraph 6 of his letter No. 266, of 5th May 1881, on the subject of a proposed rate on the lands watered from the inundation canals in the Ferozepore district, the Secretary to the Government of India, Home, Revenue and Agricultural Department, pointed out that the proposed charge could not be called a cess, or enforced as such, as long as it is not levied under legislative sanction, and he stated the opinion of the Governor-General in Council that no cesses or taxes should be levied even with the concurrence of the people, except under some more formal sanction than it is within the province of the Executive Government to accord, and he suggested that legislation in some form will be necessary, unless these and other similar irrigation works can be brought under Act VIII of 1873. In communicating these orders you, in your letter No. 593 of 30th May 1881, stated that His Honor the Lieutenant-Governor would be glad to receive an expression of the Financial Commissioner's opinion on the suggestion thus made, and you conveyed the request that the report to be submitted by the Financial Commissioner should contain information as to the practice of the levy of water-rates in all cases where they are taken as part of the district arrangements.

2. I am now directed by the Financial Commissioner to submit a copy of a memorandum recorded by him, in which he gives the information and the expression of his opinion which have been called for. He instructs me to apologize for the length of the memo. and the repetitions which it contains, but at the same time he hoped that it will be found to give information which may be of use in a general consideration of the subject of these irrigation works and their administration.

3. Mr. Lyall's present proposals may be conveniently summarised as follows:—*Firstly*, he proposes that the Canal Act should be amended by adding to it a chapter specially devoted to inundation canals, like those of the Mooltan, Muzaffargarh, Dera Gházi Khan, Montgomery, and Shahpur districts in respect to all of which the Canal Act is at present held to apply and is more or less completely enforced. Such a chapter should, the Financial Commissioner holds, contain special provisions in regard to certain matters, with reference to which the Canal Act, it is stands, is not really suitable either to the necessary conditions of the management of inundation canals in the Punjab, or to the interests of the irrigators, and it should also recognize the system of *cher* labor in force on some of these canals, *e.g.*, on those of Mooltan and Muzaffargarh. and should give the Local Government power to sanction rules for the regulation of the system. This same chapter might also, Mr. Lyall thinks, be so drafted as to allow of the recently made Ferozepore inundation canals or other similar canals which may be made hereafter, being brought under the operation of its provisions in a way to which the Ferozepore irrigators would have no cause to object. The establishment cess, which led to this correspondence, could then be sanctioned under the chapter, and the necessary powers of management could be conferred upon the the Deputy Commissioner, the Canal Superintendent, and upon pancháyats or committees of irrigators for each canal.

4. *Secondly* Mr. Lyall proposes that, in addition to the above, anoth s chapter should added to the Act which would deal with small and more or les privately managed irrigation works of all kinds, in which a number of separate families have common interests, and would give to the Deputy Commissioner or District Officer a special jurisdiction with reference to these works, on the lines sketched in the accompanying note.

5. *Thirdly*, Mr. Lyall thinks that, in the same chapter, power should be given to the Local Government (1) to appoint Committees for the management of such more or less privately managed irrigators' works, the members of such Committees to be chosen from among the irrigators; and (2) to give the Committees thus appointed powers of levying rates for the maintenance of the necessary establishments and powers of levying *zarnágha*, &c., the Committees' action to be open to interference by the Deputy Commissioner on appeal to him.

6. I am to add that since Mr. Lyall wrote his memo. his attention has been called to the report of Irrigation Committee, appointed under the Famine Commission to enquire into the management of irrigation works in Madras, and he notices that in Madras legislation is thought necessary to preserve and revive the khudi marammat system which nearly resembles the Punjab *cher* or *tinga* system. He observes also that in Madras the smaller irrigation works appear to be managed by the irrigators under the control of the Collectors.

Memo. by J. B. LYALL, Esquire, Financial Commissioner, Punjab, dated 2nd August 1882.

I THINK that the orders of the Government of India in respect to the case of the cess for pay of establishment levied on the area irrigated by the Ferozepore inundation canals raises a larger question than the point, whether the cess in this and other similar cases can be legalized under Act VIII of 1873, or only by separate legislation.

2. I do not think the Canal Act, as it stands, could be properly applied to these Ferozepore canals, or to many other irrigation works in the Province, which are in some degree under Government control, and in respect to which charges of some kind are levied authoritatively by Government officials or by headmen of villages in the name of the Government. No doubt it may be legally possible to apply the Act by interpreting freely the word "controlled" in section 3 (1) (*a*) of the Act, and if the Deputy Commissioner was appointed Canal Officer it would not be necessary to have a separate expensive canal establishment or to put the canals under the Irrigation Department. But I think the people interested would object strongly to the Act being applied on the ground of possible injury to their vested rights by the great power which the Act would give to Government officers in respect to alterations of system, diversions, and extensions, levy of water rates, &c. I think these objections would be reasonable and that in the Act, as it stands, is only really suitable and applicable to State canals constructed and maintained, as well as controlled, by Government; or to inundation canals like those of Mooltan and Muzaffargarh, which, if not wholly constructed and maintained by Government, have long been fully controlled by it.

3. These Ferozepore canals and numerous other irrigation works in the Punjab are maintained by labor supplied rateably by the irrigators. Whenever such labor is in any degree heavy or irksome, some provision must exist for realizing fines or commutation money from those members of the body of irrigators who fail to supply their rateable share of labor. If this system of maintenance of irrigation works by the combined labor of the irrigators is to be preserved, it is quite as necessary to legalize the levy of the commutation money as it is to legalize the levy of cesses to pay the supervising establishments, which in the case of the larger works are generally found to be necessary. In most, if not in all, cases in which a cess of the kind is authoritatively levied, the same authority is employed where necessary for the collection of the labor commutation money.

The Punjab Government, in its Secretary's letter No. 680 of 28th May 1879, in regard to the Mooltan canals, has expressed a strong opinion, in which

I concur, that the system should not only be preserved where it exists, but that facilities should be given for its extension. This policy may be supported, not only on grounds of economy of management, but also on the ground that it tends to preserve and promote self-government. The system is solidly founded on custom, and suits the habits and circumstances of the people concerned.

4. Again, if the Deputy Commissioner or District Officer is to take the part in agricultural administration, which I think he ought to take, and which I understand to be assigned to him by the Famine Commission, it seems to me that some executive authority should be given to enable him to assist, and to some extent control the management of irrigation works which are maintained by bodies of irrigators and to which the Canal Act is not applicable. I think legislation is wanted to enable Government, where it seems safe and necessary, to confer upon these bodies of irrigators legal powers of managing their irrigation works through members selected or elected to form Boards or Committees. But I think it would be premature to appoint such Boards or Committees everywhere. Most of the smaller works at all events will do better if the people are left to carry on, as at present, without any definite organization of the kind, till they feel the necessity and ask for it. And in the other cases where Committees are appointed, if we wish the members to do their work well and fairly, there must, in my opinion, be some officer of Government above them, vested with very strong powers of interference, to whom complaints can be easily and cheaply preferred. The members of such Committees would be under much stronger temptation to favor themselves or their friends than the members of Boards for the expenditure of local rates. The matter is of much greater pecuniary importance to them. It is true that, with little or no apparent interference by Government, certain irrigation works have hitherto been carried on effectually and so as to arouse few or no complaints of unfairness or oppression. But it must be remembered that in these cases no particular individuals have any legal powers at present; this is often a cause of difficulty, but is also a kind of safeguard; the force of custom keeps things going in ordinary times, and when difficulties occur the common necessity compels some men to come forward and act for the rest; but if you confer specific powers upon individuals, I think you must also provide a strong authority above, or the new powers will be likely to be abused.

5. Formerly in the Punjab, Deputy Commissioners did not need to refer to a statute law for every exercise of authority. Whenever people applied to them, they interfered authoritatively to maintain customary arrangements, or to revise them when some change appeared to be necessary. It was more or less a recognized part of the duty of a Deputy Commissioner as a Revenue Officer, to see that that irrigation works were maintained, and, if possible, extended. Some Deputy Commissioners still exercise this authority, or, without actual exercise use the tradition to get things done or undone. But others naturally enough dislike either to exercise or to pretend to an authority which has no legal basis, and they, therefore, refer petitioners to civil or criminal legal proceedings. This is very unsatisfactory to the petitioners, who do not understand the limitations of authority which exist: that the District Officer should not be able to interfere executively in such matters is quite contrary to their notions of good government. Such references to the courts are also in reality very unsatisfactory. The persons aggrieved are generally peasant proprietors, who do not know how to frame their suits properly, and who cannot afford to undertake protracted litigation. And officers sitting in law courts and dealing with matters in judge and lawyer fashion are quite unable to dispose properly of questions of such a nature.

6. My idea is that in the case of canals or other irrigation works not administered under the Canal Act, but in which a number of persons have a joint interest, District Officers should have special summary powers of deciding disputes between such persons as to their mutual rights and liabilities, and of passing orders as to the action to be taken for purposes of management, or as to supply on levy of share of labor, or cash contribution demandable in accordance with custom for purposes of annual repairs and maintenance works. They might be directed to be guided in their decisions and directions by custom and, in default of proved custom, as to any point by justice, equity, and good

conscience (to use the words of the Punjab Laws Act). A summary appeal might be allowed to the Commissioner, and it might be provided (as in Section 68 of the Canal Act) that the Revenue Courts' order should be final for the year or seasons, and should thereafter remain in force until set aside by the decree of a civil court.

7. There seems quite as much reason for giving the District Officer special powers on the revenue side in these cases, as for giving him jurisdiction in partition cases. If the interest of the State in a matter is a reason for giving District Officers special powers in respect to it, then they should have powers as to irrigation works; for it is evident that the State, from its being entitled to a proportion of the produce of land, as expressed in the preamble to the Land Revenue Act, has a strong direct interest in the success of such works. It may, I think, also be held that in virtue of its rights in water, as defined in the preamble to Act VIII of 1873, the State is in a way part-owner of all irrigation works drawing water from rivers, streams and lakes, and such irrigation works have hitherto been constructed, with very few exceptions, only with the express permission of the State, and by the joint action of the State and of the irrigators.

8. It may perhaps be useful to attempt to sketch the history of the subject under British rule, and the Native which preceded. Speaking generally, the persons or classes now recognized as zamíndárs or landowners in the Punjab did, no doubt, possess proprietary rights in the soil under Native rule, but their rights were not full proprietary rights. The proprietary right may be said to have been divided between them and the State, or ruling power, or sometimes between them and some local chief who paid tribute to the State. The greater part of the rent of the land went as revenue to the State, or to the tributary chief, or to some jagírdár or assignee of the State: the zamíndárs or village proprietors only enjoy certain small proprietary fees and privileges: all extensive wastes, rivers, lakes and streams were understood to be State property. This is, I think, true of all the country in which any settled government existed; but the description would not of course apply to the state of affairs which did exist for a time on the frontier and elsewhere in tracts held by tribes independent or semi-independent of any central government, and managing their own affairs in a democratic manner. This being the state of property, and the revenue being ordinarily paid in the shape of a share of the produce of each field, it is not surprising to find that irrigation works of the nature of canals or water-courses from rivers or streams were almost always constructed by the joint action of the ruler (or his representative or assignee), and of the zamíndárs or village proprietors. Most of the work was done by the unpaid labor of the zamíndárs and their dependents, but the ruler supplied direction and driving power, and often supplied some paid labour, or fed the gangs of unpaid laborers while at work. Irrigation work constructed in this way may, I think, be said to have been the joint property of the State and the irrigators and their maintenance continued to be in much the same proportion as their construction, the joint concern of the State and the irrigators, the actual labor being ordinarily supplied by the irrigators, the State only assisting by direction and enforcement of united action, and occasionally expending money on critical occasions. In some cases, however, the State regularly shared the cost of maintenance with the irrigators. The State left the irrigators to manage the maintenance of works and distribution of water as much as possible for themselves, but it interfered as often and as much as it thought necessary, and in some cases had to take almost the entire management into its own hands. This interference and management were generally exercised through the kardars and village revenue officials as part of the ordinary revenue administration of the country; but in many cases special canal officials of petty grades were appointed and paid by a special cess imposed on the irrigators. Sometimes the State collected the cess and paid the canal officials, sometimes it left their appointment mainly to the irrigators and allowed them to collect their own fees direct.

When our Government took over the administration of the country at annexation, our Deputy Commissioners and Tahsíldárs were obliged to take over the management of the canal, when they found it mainly and entirely in the hands

of the revenue officials whom they relieved. In some case where the work was heavy and difficult, as for instance in Mooltan, Dera Ghází Khan, and Montgomery, it was almost immediately found necessary to transfer the management to special canal officers; in others, *e.g.*, Muzaffargarh, it remained in the hands of the Deputy Commissioner. When the management was found to be mainly in the hands of the irrigators, our general policy was to treat it as far as possible as a matter which concerned them only, and which they should manage for themelves; but when the cost of maintenance was considerable, and the number of estates interested large, this policy of non-interference did not suit the ideas of the irrigators or the necessities of the situation. Whenever any dispute or difficulty occurred the irrigators applied, as a matter of course, to Government officers for help and interference, and so in a more or less recognized way the old system of Government supervision was maintained.

9. The degrees to which Deputy Commissioners have interfered has of course varied greatly in different districts, In order to show exactly the present state of things, I will try to describe in a general way the different classes of irrigation works which exist in the Province, and the extent to which they are self-managed or managed by Government officers. I shall not mention any State canal managed by the Irrigation Department, except the inundation canals. These may be mentioned, as though the Canal Act has been applied to them it is not altogether suitable to any, and requires considerable alteration, if the existing system of management of some of them is to agree with the Act.

10. In Himalayan districts like Kángra and Hazára, and sub-Himalayan tracts like the Andar in Gurdáspur, Bajwant in Siálkot, &c., the numerous small canals when once made require very little labor for maintenance. The irrigators under the leading of the headmen of the villages interested unite to do the necessary repairs, as the work is light and short.

The attendance is regular enough, and no regular system of payment in lieu of attendance is necessary. But often there is a custom of fines for non-attendance paid in cash or kind, and applied to the feeding or feasting of the workers. On some of the canals there are water bailiffs appointed by the irrigators, and getting small harvest dues; on others there are no such officers.

The Deputy Commissioner hears little or nothing of such canals as these in ordinary seasons. Occasionally in dry years the flow of water is scanty, and then disputes as to distribution, the position, height, and thickness of dams, or the size of openings occur, and the parties file petitions. These used to be heard on the revenue or administrative side. Now and then, when special work has to be done, owing to a landslip or similar calamity, the headmen apply for the services of one or two tahsil chaprassies to help them to collect the irrigators and supervise the work. There is one canal in a sub-Himalayan tract which has not worked well on this system. This is a canal from the Beas in the north of the Hoshiárpur district. The villages concerned were numerous and could not combine to maintain the canal. Eventually the Deputy Commissioner, with the consent, I believe, of the irrigators, made over the charge of the canal to a local notable, who agreed to maintain it on condition of receiving a water rate from the irrigators.

11. The case of the small canals fed from perennial rivers and streams in Pesháwar, Kohát and Bannu is much the same as that of similar canals in sub-Himalayan tracts, that is to say, the maintenance work is generally light and the managment mainly in the hands of the people, though in case of dispute or difficulty reference is made to the Deputy Commissioner. But on a few of the longer canals in these districts a good deal of constant official supervision by the District Revenue authorities has always been necessary. Thus in Pesháwar under the Sikh Government there was a managing establishment paid by a cess on some of the canals which we have maintained, and in Bannu there have been daroghas paid from a cess or fines from the commencement of our rule to supervise the construction by the irrigators of the dams and head works of the largest canal, and the distribution of the water on certain new extensions made by our Government. Both in Pesháwar and Bannu *zarnágha* or non-attendance money is levied at certain rates from irrigators who do not furnish their share of labor for the annual clearance and maintenance work.

12. In the Dera Ismail Khan and Dera Ghází Khan districts there are no big perennial streams or rivers coming out of the hills; the water of such perennial streams as exist is all used up for irrigation; in the case of the largest, *i.e.*, the Gumal and Tank Zam in Dera Ismail Khan, the distribution of the water is controlled by the Deputy Commissioner with the assistance of a special establishment. The management of the other smaller streams is, except in case of dispute, left very much to the zamíndárs. Disputes do not often happen as the water is all owned in shares by the men of one clan or by a few villages. But though the perennial streams of these two districts are small, a great volume of flood water comes out of the hills in rushes at certain seasons. To utilise this water for irrigation, large dams are built across the natural channels, and the water is thus thrown out upon the surface of the surrounding country. Each field is embanked so as to catch the water and hold it long enough to give the soil a thorough soaking. The dams are built by the combined labor of the irrigators, absentees paying *zarnágha* or non-attendance money, which is expended on the works. The distribution of the water is ordinarily managed by the leading men, in accordance with custom, but in the case of the big Luni and Takwara torrents in Dera Ismail Khan a great amount of supervision and direction by the Deputy Commissioner and his subordinates, including irrigation daroghas and moharrirs, is found absolutely necessary. And to a less extent such official supervision is also found necessary in the case of second-rate torrents, like the Vahowah, the Langarh, and the Kaha (*see* paragraphs 399 to 401 of Mr. Tucker's Dera Ismail Khan, and paragraph 171 of Mr Fryer's Dera Ghází Khan, Settlement Reports).

13. Of the inundation canals working in the Punjab the only ones which existed before annexation are those in the Mooltan, Muzaffargarh and Dera Ghází Khan districts, and the Khanwah in Lahore and Montgomery. The last named canal was an old one almost out of use till repaired by Government towards the end of the Sikh rule. The Sikh Government undertook the cost of the annual clearance of the head and main channel, and partly recouped the cost by an abiána or water-rate of eight annas a ghumao. For its profit the Government looked to the land revenue. At annextion we maintained the Sikh arrangements, but the officers of the Irrigation Department were put in charge; they have enlarged and extended the Khanwah, and have also converted three other old channels into irrigation canals. In the re-settlements of the Lahore and Montgomery districts, completed in 1869 and 1872, the fixed land revenue on the lands irrigated by these canals was assessed as if the canals did not exist, and it was arranged that the demand on account of canal irrigation should be collected by acreage rates on crops, which are virtually canal-owner's and occupier's rates. There is at present no legal basis for the levy of these rates, but proposals have been recently submitted for legalizing them by a notification under the Canal Act.

14. In the three districts of Mooltan, Muzaffargarh and Dera Ghází Khan the numerous large inundation canals upon which the most important part of the cultivation of these districts depends were always managed in former times by the rulers of the country with the help of their kardars or revenue collectors and the local headmen. Without the constant use of authority from above the irrigators would never have worked them satisfactorily, as the labor required for maintenance is heavy, and as the number of villages depending on each canal is generally large.

The *cher* labor system by which the irrigators supply, in proportion to their irrigation, the labor required for the annual repairs or clearances, and in case of default pay a cash commutation known as *zarnágha*, was originally in force in all three districts.

With the system of canal management, and with a land revenue taken in the form of a share of the produce and cash acreage rates on certain crops, there was no necessity for the levy of canal-water rates. Diwan Sáwan Mall, long the Sikh Governor of the Suba of Mooltan, worked this *cher* system with greater force and effect than former rulers, and much extended and improved the canals in Mooltan and Muzaffargarh, but in Dera Ghází Khan he found the people less amenable. Eventually he adopted the policy of abolishing *cher*

labor in this district and of undertaking the clearance of the canal heads and main channels at the cost of Government, imposing at the same time a tax in lieu of *cher* labor under the name of *hasil cher* consisting of certain extra fees in kind and cash on the produce of irrigated lands. When the Diwan imposed these fees he gave out that they were calculated to recoup only half the cost of clearance, but it is believed that in the end as irrigation extended the income from them almost covered the whole cost.

At annexation the Mooltan canals were almost immediately made over to the charge of a Canal Officer, but the Muzaffargarh canals remained till quite lately in charge of the Deputy Commissioner and his Tahsíldárs. In both districts the *cher* labor system was maintained, and is still in force. In the annual assessment of the *cher* labor, and in the supervision of the gangs when at work, the Canal Officer is assisted by a *panchâyat* or committee for each canal, the numbers of which are appointed by nomination from among the irrigators. In Dera Ghází Khan our Government adopted the rule which it found in force, and cleared the canal at its own cost. In place of the *hasil cher* dues (which had to be abolished when fixed cash assessments of land revenue were introduced) half the cost of clearance was recovered from the villages by a rate on irrigation. The zamíndárs' assertion that the Diwan had taken only half cost from them was accepted as a reason for not charging the full rate. The canals of this district were for a time in charge of the Deputy Commissioner, but before long it was found necessary to appoint a Canal Officer, as in Mooltan.

15. In all three districts, *i.e.*, Mooltan, Muzaffargarh and Dera Ghází Khan, we imposed cash assessments of land revenue fixed for the term of settlement on all estates including canal-irrigated ones. The effect of this change was of course very great. Under the native land revenue system the Government demand from canal-irrigated estates followed exactly the outturn which depended upon the good or bad working of the canals. The demand therefore could never be crushing, and the Revenue Officer had the strongest interest in the good working and extension of the canals. Under a fixed cash assessment system, in the first place, nothing but a very light assessment could work, particularly in the case of tracts irrigated by canals of uncertain flow. The assessments first made soon after annexation had to be very greatly reduced to save the country from ruin, and in spite of such reduction the revenue in certain years and on certain canals has been collected with much difficulty from the poorer class of proprietors; and secondly, neither canal officer nor revenue officer had the same direct interest in the good working and extension of the canals, as whatever improvements might be made, the revenue remained the same. In the recent re-settlements of Mooltan and Muzaffargarh the fixed land revenue assessment of lands irrigated by these canals has been maintained; but arrangements have been made (1) for the remission of part of the demand on failure of canal-water, and (2) for the assessment of a canal-advantage rate on land not assessed as canal-irrigated at settlement, to which canal-water may be subsequently applied.

16. The Canal Act, though not in all respects suitable, has been held to apply to all these inundation canals in Mooltan, Muzaffargarh and Dera Ghází Khan, and in their management the powers conferred by the Act are used by the officers of Government. But it has been held by the Government of India that the *cher* labor system and the levy of the *zarnágha*, or cash commutation, for labor cannot be legalized by rules under the Act. The rules which define this system and the levy of the *zarnágha* are therefore at present unsupported by any statute law. The system rests upon custom and popular consent: if the irrigators refused to supply labor or to pay the *zarnágha*, Government would be compelled to substitute a canal occupier's rate. *Cher* labor is in fact occupier's rate paid in the shape of labor on the canals. In the same way there is at present no legal basis for the levy of the half clearance charge on the Dera Ghází Khan canals, as the orders of the Local Government on the subject have not been issued in the form of a rule under the Canal Act. But the charge is of the nature of a very light occupier's rate, and might be legalized by a rule under the Act.

17. The Shahpur inundation canals have all been made since the first regular settlement of the district. The cost of the construction of five of them

has been paid for out of public monies, and they belong to Government. Three of them are nominally under the Irrigation Department, and the income of these is credited to Canal Revenue. The income of the fourth is credited to Provincial Revenue, and that of the fifth to the District Fund, from which the costs of its construction was paid. They are all five managed by the Deputy Commissioner and the Tahsíldárs with the aid of a small special establishment. The clearance and maintenance of these canals is effected at the cost of Government, and water-rates of the nature of occupier's rates are levied. The Canal Act is supposed to be in force; rules issued under the Act have been notified as applying to these canals. But the water-rates levied have never been properly notified under the Canal Act. There is, however, apparently no obstacle to their being at once notified as occupier's rate leviable under the Act.

The other inundation canals in this district have been made at private cost, and are maintained in the same way. The larger and better managed ones were all made by men of some capital, either single individuals, or two or three in partnership: where such canals water the lands of persons other than their owners, a water-rate is paid in the shape of a one-fourth share of the produce. The water-rate, if not paid willingly, can only be recovered by civil suit; the system is likely to lead eventually to difficulties. Some of the smaller canals are jointly owned by all the proprietors of the two or three villages who united to dig them, but in the absence of authority and from want of unanimity these are very imperfectly maintained.

18. It may be noted here that till lately there were in Dera Gházi Khan several private canals made by men of capital with the permission and support of the district authorities; but they were badly managed, and for this and other reasons it was found advisable to buy out the rights of these private owners. There are also two canals of this kind in Mooltan owned by Ghulam Kadir Khan, Khakwani, and Ghulam Muhammad, Daulatána, but the lands they irrigate belong almost entirely to the canal-owners, and therefore no difficulty has yet been experienced. A private inundation canal of the same kind is now being constructed by Mr. Broadway in Jhang. In the same district there is a small irrigation canal near Shorkot constructed some years ago by the irrigators with the countenance and at the suggestion of the Deputy Commissioner; but for want of authority and unanimity it is very badly maintained and of little use.

19. The Ferozepore inundation canals have all been made lately at the suggestion and with the assistance of Major Grey, the Deputy Commissioner. Those in the Mamdot jagír territory were, I believe, made and are now maintained at the cost of the estate of the Nawab of Mamdot. A water-rate is levied on the Mamdot canals which is credited to the Mamdot revenues. In the rest of the district the canals were made at the expense of the irrigators under the direction, and with the active support and countenance of the Deputy Commissioner and his assistants and Tahsíldárs. They have since been maintained by labor supplied by the irrigators, but the management has been in the hands of the Deputy Commissioner and the Tahsíldárs aided by the local headmen. In virtue of an agreement made when the canals were being constructed between Major Grey, the Deputy Commissioner, and the leading irrigators, a small rate per acre of irrigation has been levied to provide the pay of mirahs and canal patwárís. The rate has lately been increased in order to pay a special canal establishment, the work being found too heavy for the Tahsíldárs.

20. There are certain works which are something like inundation canals, but do not deserve the name. An inundation canal often runs for part of its course in an old disused minor channel of the river, but most of its channel is excavated and it carries water to lands quite beyond the reach of the ordinary river floods. The works I am referring to consist of dams and cuttings in the back waters or side channels in the khadirs or beds of the great rivers in the south of the Punjab. The lands in these khadirs, owing to the deficiency of rainfall, depend for their cultivation upon the autumnal river floods. In years of good floods those channels fill and overflow, and the lands around them are thoroughly moistened by flood or percolation. But in years of low floods, or in parts of the khadir which are most distant from the actual river current for the time being, these channels often fill very incompletely and occasionally

sand banks form across them near the river and stop the ingress of water. To remedy this the men of the villages, affected by such channels, often unite and dig cuttings through sand banks and erect temporary dams and embankments lower down across the channel, to throw the water on to the fields or to prevent it from finding its way back into the main river. In Dera Ismail Khan and in some other districts the people have been in the habit of combining for such work, and have been assisted to do so by the Deputy Commissioner and the Tahsíldárs. In Dera Ismail Khan and lately in Bannu, lists have been drawn up of the gangs contributable by each village, rosters of attendance have been kept, and *zarnágha* money levied from absentees. In fact a rough kind of *cher* labor system has been organized with great effect.

21. As instances of similar arrangements elsewhere, the Halkiwah in the north of Jhang district near Kalowal, and the Padi in tahsíl Fázilka of Sirsa may be mentioned. The last named channel almost deserves to be ranked as an inundation canal.

The Nikki in the Montgomery district is another instance. At various times since annexation the Deputy Commissioner has spent money in attempting to improve this water-course, or has assisted the zamíndárs to combine and provide labor. The irrigation being very uncertain, it was arranged at both the settlements of the district that the fixed assessment of the land should be at dry rates, and that an additional rate of eight annas per acre should be paid when water was received from the canal. It was lately arranged that this channel (for it does not deserve the name of canal) should be made over to the charge of the District Committee, which promised to spend money upon improvements and to look for recovery from the collections of the irrigation rates which were also assigned to the Committee. A similar arrangement was made with the District Committee of Gurgáon during the recent settlement of that district, in respect to the Kotila and Chandani jhils drainage and embankment works. These were formerly in charge of the Irrigation Department, but had to be abandoned as unprofitable. Both the maintenance and the revenue have now been made over to the District Committee for a term of years on certain conditions.

No. $\frac{78}{1347}$, dated Lahore, 6th November 1882.

From—H. C Fanshawe, Esquire, Offg. Junior Secretary to Government, Puajab.

To—The Senior Secretary to Finanical Commissioner, Pnnjab.

I am directed to acknowledge the receipt of your letter No. 834 of 17th August, forwarding a memorandum by the Financial Commissioner on the subject of the management of inundation canals and similar works in the Punjab, and of the legalization of the levy of labor or labor commutation money for the same, and, in reply, to convey the thanks of the Lieutenant-Governor to Mr. Lyall for his very valuable paper.

2. The letter and memorandum have been forwarded to the Irrigation Department for opinion and remarks, and the further action to be taken in connection with them will be settled on receipt of Colonel Home's reply. Copies have also been submitted to the Government of India for information, and the Chief Commissioner of Sind has been requested to furnish this office with information as to the system of canal clearances in that Province, and the provisions, if any, which exist for legalizing the levy of statute labor, or of commutation money in its place.

No. $\frac{79}{1348}$, dated Lahore, 6th November 1882.

From—H. C. Fanshawe, Esquire, Offg. Junior Secretary to Government, Punjab,

To—The Joint-Secretary to Government, Punjab, Public Works Department, Irrigation Branch.

Financial Commissioner's No. 834 of 17th August, and Memorandum.

I am directed, to forward, for the favor of your opinion and remarks, copy of the letter marginally noted, from the Financial Commissioner of the Punjab, covering a memorandum by Mr. Lyall on the subject of inundation canals and other

similar works in this Province, and the legalization of the levy of the labor and the labor commutation money which are required for their maintenance.

2. It is understood that the Canal Act of 1873 has not been found to work satisfactorily in all respects in the Punjab, and that amendments of it are considered necessary on some points. It will perhaps be convenient, therefore, to take up the above question at the same time as the proposals made by Mr. Lyall for adding to the Act; but as the latter subject is a sufficiently large one of itself, I am to ask that, if it is desired to amend the Act in other respects, any suggestions for so doing may be made in a separate communication.

3. A copy of the correspondence in connection with the Ferozepore canals, from which the present reference has arisen, is also forwarded for your information.

No. $\frac{80}{1349}$, dated Lahore, 6th November 1882.

From—H. C. Fanshawe, Esquire, Offg. Junior Secretary to Government, Punjab,

To—The Secretary to the Government of India, Revenue and Agricultural Department.

No 834, dated 17th August 1882, from Secretary to Financial Commissioner, Punjab, and enclosure.
No. 79, dated 6th November 1882, to Secretary to Government, Punjab, Public Works Department, Irrigation Branch.

Adverting to your letter No 266 of 5th May 1881, I am directed to forward, for the information of the Government of India, copies of the papers marginally noted, and to say that the further action which the Lieutenant-Governor may order to be taken in the matter will also be reported in due course.

B.

Papers as to the proper method of clearing of Inundation Canals.

Particular canals or systems of canals controlled by Government.

No. 1831, dated Lahore, 23rd February 1883.

From—F. C. Channing, Esquire, Senior Secretary to Financial Commissioner, Punjab,

To—The Commissioner and Superintendent, Mooltan Division.

Extracts from paragraphs 32 and 33 of the Baháwalpur Administration Report for 1871-72, by Captain Grey.
Paragraphs 11 to 21 of Appendix to Report on Baháwalpur State for 1877-78, by Mr. Barns, Superintendent of Irrigation.

I am directed by the Financial Commissioner to forward you copies of the papers noted in the margin, and to request that you will communicate them to the Deputy Commissioner of Mooltan and Muzaffargarh, and ask them to report through you, after consulting the Canal Officers of their districts, whether they think that the existing system of canal clearance can be improved by the introduction of extension of a system of distributing the work by *daks* in the manner described in these papers, and by the construction of fixed bench-marks.

Extract from Administration Report of the Baháwalpur State for 1871-72, by Captain L. J. H. Grey, Officiating Political Agent.

32. . . . . The system now pursued is to estimate the cubic contents of clearance, and the number of men required to perform it in a given time, who are assessed on the landholders according to cultivated area. The canal is then taken in lengths of a mile, and each mile allotted (by arbitrators in conjunction with Revenue officials) to the landholders, to be cleared within a period fixed for that particular mile, under heavy penalty. After finishing their *daks* in one mile, people went off to their fields till it was time to take up their *daks* in the next mile. This scheme, which was drawn up by Názims Núr Muhammad Khán and Lálji Parshád, and elaborated gradually in consultation with other practical men, has worked with entire success. Each individual, knowing that he would only have his own quota to do, found his account in doing it quickly by putting on more men than he was assessed for, and thus earlier re-

leasing his cultivators for their ordinary avocations. The canals were cleared and running much earlier (in some instances two months) than was ever the case before, and were completed to specification, which was seldom attained before, and in lieu of many thousand rupees of *nágha* as in previous years, there was none. We were enabled to dispense with the curse of temporary supervisors: and great State officials and others who had always evaded their clearance found themselves compelled to complete their quotas.

33. A modification of the same principle was applied with equal success to new work, such as extensions and developments, and restoration of canals fallen out of gear, performed by paid or unpaid statute labor. In works performed by paid labor, statute or free, the principle advocated by the Superintendent of Irrigation, of settlement by *daks, i.e.*, calculating and paying for each *dak* as completed, has been introduced, and is very rigidly enforced, and will have great effect on the labor market.

Formerly payment on account used to be made, and measurement had to be made and a settlement fudged in a hurry at the last moment when the water was on the point of being let in; and as the Revenue officials took much credit to themselves for effecting *kasrat*, or savings on estimated cost, it is easy to imagine the injustice frequently perpetrated.

Extract from Appendix to the Report on the Baháwalpur State for 1877-78, by Mr. W. H. Barns, Superintendendent of Irrigation.

* * * * *

16. The bench-marks laid down in the bed are of stout kíkar from 6 to 9 inches in diameter, and of a length not less than 3 feet, with a cross-bar through, near the lower end, to make it difficult of extraction.

17. Every canal being divided into miles, commencing from its permanent head, each mile is again sub-divided into sixteenths, of 330 feet each, called numbers; thus there are sixteen numbers in every mile. At each of these numbers one of the above-named wooden bench-marks has been sunk, and its top surface adjusted by a surveyor with the spirit-level.

18. In addition to the wooden bed bench-marks, others of bricks, $2\frac{1}{2}$ feet by 6 inches by 6 inches, have been sunk on the high bank—for the first five miles from the head, one at the commencement of each mile; thenceforward, for the next four miles, one at the commencement of each second mile; and thereafter one every four miles. In order that the position of these bench-marks, in the bed and on the bank, should be easily found, mud pillars, nicely plastered, have been built opposite to the bed bench-marks, and in each of these pillars a brick has been inserted, on the face of which, before being burnt, had been stamped the name of the canal, and also the mile and number; the object of this being that, when any part of a canal, is referred to in any report, instead of describing its position as being near such and such a well or village, the mile and number of the part of the canal referred to can be quoted, whereby the exact locality which forms the subject of any report may be understood at once.

19. The total number of bench-marks thus fixed (wooden and brick together) is 17,200. The numbers of pillars erected, each with its distinguishing mile-and-number-engraved brick, is 10,478 and the total mileage thus provided is $641\frac{1}{2}$. The total number of miles levelled, in connection with the above arrangement, including original, check and counter-check levels, is 2,616.

20. The bench-marks were sunk by the zamíndárs, who likewise constructed the pillars. The total of all other expenditure, *viz.*, surveyors' and artificers' wages, cost of bench-marks and their carriage, was Rs. 23,247-12-9.

21. The carrying out of this undertaking on a fixed and uniform principle will have been an indelible record of the great boon conferred on the zamíndárs in particular, and on the administration generally, during this your second tenure of office in the State, and, next to the settlement, no single act of administration has, so for as I can see, given such universal satisfaction.

No. 1833, dated Lahore, 23rd February 1883.

From—F. C. Channing, Esquire, Senior Secretary to Financial Commissioner, Punjab,
To—The Commissioner and Superintendent, Hissár Division.

I am directed to acknowledge the receipt of your letter No. 26 of 6th February.

3. With reference to paragraph 4 of your letter, I am to remark that Mr. Lyall thinks that he understands the Ferozepore system. That system seems to him to be a very good one; but there is one point in it as to which he feels some doubts, *viz.*, whether the execution of the work allotted can, in practice, be exacted only from the men interested in the irrigation and in proportion to their interests, and without using illegal means of compulsion. If the proprietor class is able in practice, to shift on to the shoulders of the tenant more than the tenant's fair share of the work, and to exact much unpaid labor from *kamins* and other dependents, then Mr. Lyall is disposed to hold that, in respect to fair adjustment of burden of work upon the shoulders of the parties interested, the Mooltan system is superior.

4. Again, in addition to the want of a check upon the proprietor's power of shifting the burden upon other people's shoulders, there is also, Mr. Lyall thinks, a want of a legal or recognized penalty. In paragraph 32 of the Baháwalpur Administration Report for 1871-72 (a copy of which forms part of Appendix B to your letter under reply) the following words occur: "allotted in pieces called *daks* to the landholders, to be cleared within a period fixed for that particular mile, under heavy penalties." In a Native State there would be no difficulty in providing a fitting penalty, but in a British district this would not be easy; accordingly, no penalty seems to be provided in the Ferozepore agreement, for the power of the Tahsíldár to levy money at a labor-commutation rate, and to have the work done by paid labor, is not a power easy to use efficiently (as has been proved by experience), and, moreover, can hardly be called a penalty. The danger, of course, is that, in the absence of an efficient legal penalty, illegal forms of compulsion will be applied, and when such compulsion is used, it is likely to be often used unfairly as well as illegally. Its application by inferior officials or headmen cannot be checked or tested; being irregular, its use is denied and leaves no trace.

It is to be hoped, however, that the Canal Act will be so amended as to give any powers necessary for working efficiently the system introduced by you.

6. I am to add that Mr. Lyall thinks that the description of the *cher* system given in the Baháwalpur Administration Report for 1871-72, though no doubt absolutely true of the system as worked in Baháwalpur, is not a fair one of the system as worked in Mooltan and Muzaffargarh.

In both districts the custom has been to estimate the amount of work to be done; in Mooltan it is calculated how many men working each for 90 days could do the work, in Muzaffargarh how many men working one day each. The distribution is then made according to irrigated area of holdings by assessing each village, and within the village each irrigator, with so many 90 days' labor or fractions thereof in Mooltan, and with so many one day labor Muzaffargarh. It is not, Mr. Lyall believes, true in these districts that a man who did not furnish his full quotum of labor from the date fixed could not escape *nágha* by furnishing more, later, before the conclusion of the work. Mr. Lyall believes the account was ordinarily made at the end of the work. But, no doubt, pressure was applied to make men begin work together, and not shirk going to distant work at the canal-heads or elsewhere; very probably, in special cases of the kind, pressure has been applied in the form of refusing to allow men to furnish excess labor later when they had shirked giving full labor at first.

Again, the *dak* system is not unknown in these districts; it has long been used more or less on some of the Muzaffargarh canals.

Mr. Lyall fully agrees, however, that your detailed system of *dak* distribution of each mile and of bench-marks is well devised, and thinks that it might probably be with advantage much more used in Mooltan and Muzaffargarh than it is; and he is not sure how far bench-marks have been fixed. He proposes, therefore, to send extracts from appendices B and D of your letter to Deputy Commissioners, Mooltan and Muzaffargarh, and to ask them to give their opinion as to whether improvements could not be effected in these directions.

No. 48, dated Camp, 7th March 1883.

From—Lieutenant-Colonel L. J. H. Grey, c.s.i., Offg. Commr. and Superintendent, Hissár Division,
To—F. C. Channing, Esquire, Senior Secretary to Financial Commissioner, Punjab.

With reference to your No. 1833, dated 23rd February 1883, I venture to submit, for the Financial Commissioner's consideration, a memorandum* contrasting in detail the *dak* and *cher* systems, and I attach thereto a note in original by a very competent authority.†

* Enclosure A.
† Enclosure B.

2. As regards the imposition of the work by the proprietors on the tenants and *kamíns*, it is my experience that these are well able to take care of themselves, and not likely to be oppressed by the exaction of work from them out of proportion to their interest. On this subject I attach a memorandum by Babu Mya Dás, Superintendent of Irrigation in Ferozepore.‡

‡ Enclosure C.

3. When in Baháwalpur, 1871-72-73, I was in close touch with the Mooltan *cher* system though Saiyad Murad Shah, Extra Assistant Commissioner, the Chief Judge of the Baháwalpur State, who was a landowner in Mooltan. He gave me an accurate insight into the state of affairs in Mooltan, and it was, by his account, no better than in Baháwalpur. This view is supported also by E. C. P. (Enclosure B). In practice, no person of wealth and consideration ever did his fair share of the work—often, indeed, *no share*, though of course put to some expense in feeing the *háziri* moharrirs.

4. With reference to the introduction of the *dak* system into Mooltan and Muzaffargarh, should it be objected that a new and unfamiliar system may be unacceptable to the people, I would point out that the *cher* system was as firmly established in Baháwalpur as in either of those districts. Nevertheless in Baháwalpur the relief afforded by a change to the *dak* system was at once understood and thankfully accepted (see annexures B, C and D of my letter No. 26, dated 5th February 1883).

5. The Financial Commissioner has consulted the Deputy Commissioners of Mooltan and Muzaffargarh, but it is possible that neither of those officers has turned special attention to canal management. I venture to suggest further references to Mr. E. C. Palmer, who, as Superintending Engineer of the Lower Bári Doáb, had special opportunities of studying the *cher* system, and to Mr. J. W. Barns, M.I.C.E., late Superintendent of Irrigation, Baháwalpur State, and now at Almorah.

6. I fully recognize the fact that sooner or later an amendment of the Canal Act will be required affording power to perform the *dak*, or share of work due from any irrigator, in case of his neglect, and to levy from him double the value of the work executed.

At present, both in Ferozepore and Baháwalpur the work proceeds without friction. The "heavy penalties" spoken of by me in the latter State were *brutum fulmen*, as I discovered on my return there in 1877.

A

Memorandum on the *Cher* system of clearance existing in Mooltan and Muzaffargarh as contrasted with the *dak* system of Ferozepore and Baháwalpore, by Colonel L. J. H. Grey, Officiating Commissioner and Superintendent, Hissár Division.

The *cher* system is described with sufficient accuracy by Mr. Elliott in a note at page 83, Appendix 5, of the Famine Commission Report. The Ferozepore system is described in the "General Rules" of Appendix 9 at page 32 of the Appendices of my Ferozepore Canal Report for 1876-77. The systems may be contrasted as follows:—

(2). The theoretical *cher* is obtained by dividing the irrigated acreage of a canal for the year preceding clearance, by the number of laborers, working each for 90 days, required to clear the main beds of the canal. This number is said to be known to the Canal Engineer or the Deputy Commissioner "by the experience acquired over a period of years"—in other words, it is a very rough average. The quotient is the number of irrigated acres which are bound to

produce one *cher*—the average number is about 25 acres. If a proprietor owns 25 acres of irrigated land, he has to supply one laborer for 90 days; if he owns 10 acres, he has to supply two-fifths of such a laborer—that is, a laborer working for 36 days.

(3). This is the theoretical *cher* system, and I can hardly imagine anything clumsier or more unsatisfactory. Let it be contrasted with the system introduceed by me in Baháwalpur and Ferozepore.

(4) There, three bench-marks in the bed of the canal at every 330 feet show the width and designed bed. In November the heads of these are uncovered, and the depth of silt is measured on each. This gives the area of clearance at every 330 feet, and the mean of two areas multiplied by 330 gives the cubic contents of each length (16 to the mile). Thus the total cubic contents of clearance of each canal are known, and so is the irrigated acreage, from the patwarís' measurements (they are paid a rate for their trouble), which are completed during November. The cubic contents divided by the acreage give the rate of cubic feet of clearance per acre irrigated.* That rate, multiplied by the total irrigated acreage of each village, gives the task of that village in cubic feet. The clearance rolls are then searched for a length or lengths † containing clearance about equal to that task, and situated as conveniently as possible for the village. This task is called a *dak*, and is made over to the village to be cleared by a given date, say 1st March. If near enough, the people go there as convenient and do their work. If not, they give the *dak* on contract to some village more conveniently situated, generally taking on contract the *dak* of some other village in the same way. The interior distribution of the work in the village is left to the people, and no disputes arise, as the cubic contents of the village *dak* are known, and the cubic rate per acre is known, and the irrigated acreage of each shareholder is known.

It will be seen how inferior even the theoretical *cher* system is to the above. But let us see how that system works in practice.

Mr. Elliot writes:—"In practice, however, the number of *chers* allotted to each village does not depend so much on the irrigated acres as on past precedents, and on the knowledge the *pancháyat* holds as to the capacity of the village to supply labor." This *pancháyat* practically assesses the quotas of the villages without reference to the theoretical *cher*, subject to an appeal to the Canal Officer, who "attends to any in which considerable injustice is done." It is evident, however, that he must be much in the dark when attempting to decide between the *pancháyat* and the villages.

So far as regards allotment of clearance; now for the method of doing the work. I have explained that in Ferozepore and Baháwalpur the people do this when and how they please, so long as the clearance is effected in time for test on a given date. This test merely consists in seeing that the clearance is even throughout with the heads of the bench-marks, and also is of the full width shown by them. There is no dispute and no difficulty for either the people or the testing officer, for there are the bench-marks to show depth and width beyond possibility of cavil. There is no dragging out of the people when inconvenient to them, no fines, no interference of any kind whatsoever.

Now under the *cher* system, the whole of the laborers *of every village on the canal* "have to meet on the 15th December at the place fixed by the Canal Officer, ordinarily the mouth of the canal, and to work downwards." They "sleep under trees or wherever they can," working under the most inconvenient conditions imaginable. They have no guide as to the work to be done, save the orders of the Canal Officer and his subordinates, but we are told that "in practice they generally know how much to do, and can distinguish the silt deposit from the original bed of the canal!" They must be remarkably intelligent if they can. In fact, this matter is a fertile and constant source of dispute; the laborers always declaring that they have dug beyond the regular bed, and the supervisors complaining that they have cleared short of it. The fact is that there is no regular bed under this wretched rule-of-thumb system.

* Each acre of lift irrigation whether by *jhalár*, *jatha* or *dhingli*, being taken as half an acre, so as to allow fairly for the cost and trouble of lift.

† Being the lengths of 330 feet before mentioned.

In conclusion, let us contrast the abuses. Under my system no money passes, no interference is exercised, the zamíndárs are left to themselves, and see and know exactly what they have to do, doing it in their own way and at their own time. If they do not work themselves, but for convenience give their *dak* to another village on contract, it is their own affair, which they settle for themselves, and no official need be ever cognizant of it. The officials themselves are men paid by the people by a *bachh*, or rate on the irrigated acreage which the lambardárs meet annually in December to assess. Evidently, under such a system, abuses, if they exist, are reduced to a minimum. Compare this with the *cher* system under which the Canal Officer keeps a writer to take the names of each *cher* down day by day, and by checking this he prepares a list of absentees, and sends it in to the Deputy Commissioner, who collects the fines.

Now, when Sáwan Mal started this system it was intended that in the place of every absentee a man should then and there be hired at his expense. Instead of this the work is done by those unfortunate *chers* who *are present*—that is to say, that some one else has to do the absentee's share of work in addition to his own; and the fine is credited to a fund which now amounts to over two lakhs in Mooltan alone! But this is not all. The writers spoken of are entertained and paid Rs. 15 per mensem *only for the period of clearance*, and they live all the rest of the year on what they earn then. This speaks for itself. I write advisedly, from Baháwalpur experience, when I say that they are glad to take the posts without salary at all, and would even pay for them into the bargain. This as a fact they generally have to do. Mr. Elliot writes—"Mr. O'Brien" (Deputy Commissioner of Mooltan) "gives a bad account of the working of the system in this district as unfair, wasteful and inefficient." Of this I imagine that there can be little doubt, and I would strongly recommend that, in lieu of the *cher* system, the *dak* system introduced by me into Baháwalpur and Ferozepore be adopted on the Mooltan and Muzaffargarh canals.

The canals might be levelled and bench-marks laid down during next cold weather, and the *dak* system simultaneously adopted. I attach details of the manner in which this measure was carried out in Baháwalpur in 1878, which is the same as that adopted previously in Ferozepore: also of the orders of Government on the subject.

Extract from the Baháwalpur Administration Report for 1877-78.

* * * * * * * *

16. The bench-marks laid down in the bed are of stout kíkar from 6 to 9 inches in diameter, and of a length not less than 3 feet, with a cross-bar through, near the lower end, to make it difficult of extraction.

17. Every canal being divided into miles, commencing from its permanent head, each mile is again sub-divided into sixteenths, of 330 feet each, called numbers; thus there are sixteen members in every mile. At each of these numbers one* of the abovenamed wooden bed bench-marks has been sunk, and its top surface adjusted by a surveyor with the spirit-level.

18. In addition to the wooden bed bench-marks, others of bricks, 2½ feet by 6 inches by 6 inches, have been sunk on the high bank—for the first five miles from the head, one at the commencement of each mile; thence forward, for the next four miles, one at commencement of each second mile; and thereafter one at every four miles. In order that the position of these bench-marks, in the bed and on the bank, should be easily found, mud pillars, nicely plastered, have been built opposite to the bed bench-marks, and in each of these pillars a brick has been inserted, on the face of which, before being burnt, had been stamped the name of the canal, and also the mile and number; the object of this being that when any part of a canal is referred to in any report, instead of describing its position as being near such and such a well or village, the mile and number of the part of the canal referred to can be quoted, whereby the exact locality which forms the subject of any report may be understood at once.

* In Ferozepore I laid down *three* bench-marks at each number—one in the centre, the others showing the true width.

Extract from Punjab Government (Foreign Department) Proceedings No 1331 of 11th October 1887.

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14. The clearance on some of the canals has entailed exceptionally heavy work during 1877, more especially on those which border the Sutlej from Baháwalpur downwards. An excellent measure has been taken in the systematic laying of permanent bench-marks on more than half the canals in the State, so that in after years the exact depth to which the clearance should be made will be known without the necessity of re-levelling.

The canals have also been divided into sections of 16 for every mile, the number of each section being marked so that the part of any canal which may form the subject of a report will at once be understood without any necessity for a further description of the locality.

B.

Note by Mr E. C. PALMER on Colonel Grey's Memorandum contrasting the advantages of distributing statute or commercial labour by day's work (*chers*) or by measured quantity of work (*daks*):

There cannot be two opinions on the merits of the two systems—at all events, any one who has worked both (as I have) must have been impressed with the unnecessary oppression and unsatisfactory amount of work done by the *cher* system as worked on the Mooltan canals.

But in discussing the merits and demerits of each, we must be careful not to condemn the *cher* system, as a system, because we see it fail from unintelligent handling.

A prestige attaches to any code of rules which has stood the test of time, and, as a foreigner, I hesitate to condemn as worthless a scheme which, probably adapted from some ancient customs, found favour with so astute a ruler of his countrymen as Sáwan Mal.

For instance one great blot which Colonel Gray must properly lays great stress on is the compulsory assembling of the laborers on a certain date, instead of allowing them to do what was their share when it suited their convenience.

From enquiries I made on the Mooltan canals in 1876-77 I came to the conclusion that this and some other innovations were of recent date, and bitterly resented by the people.

Again, although Sáwan Mal's use of the stick instead of the *nágha*, or fine for non-attendance, may seem dreadful in our "reign of law," it was better suited to the people than the fines, the bribes, and the general worry, that now obtain.

Again, it must not be urged against the *cher* system that it involved the monstrous abuse of hoarding up the fines for non-attendance; the very essence of the justice of these fines lay in the money being spent at the place where it was levied and when it was levied.

I am so impressed with the great value of statute labor for a poor country as opposed to cash assessments for local improvements, that I am unwilling to say anything that would detract from *any* system that provides for such improvements being done without the intervention of the tax-gatherer; and I write not altogether from a theoretical point of view. I have worked myself in Canada as a statute laborer, where it was held to be unneighbourly, unsociable to pay the fine, and every farmer attended himself with his cattle and implements.

A cash road "cess" would have been as unpopular as the *siwái* of the Punjab to the farmer, while a "road-making bee" was a pleasant break in the monotony of farm work, and resultedin good roads being rapidly made, school-houses built, &c., &c., with practically no cash expenditure, and what would have been an idle day usefully and pleasantly employed.

I am quite aware that to attempt to graft Colonial customs on Punjab habits would be a failure; yet more can be done in this direction than those who have not tried would expect.

In 1880 I had to clear the lower portion of the Western Jumna Canal, some 40 miles. The work had to be done within one month; the amount of work and the cost had been previously estimated.

I determined on doing it by the *dak* system, precisely as described by Colonel Grey. The only pressure I could use to make each village turn out its quota of labor was the threat that the water would not enter the canal until the clearance was complete.

Scarcity of establishment prevented my being able to supervise the work all at once. The villages were formed into groups of four or five, who came, in some cases for miles, with beat of drum and a variety of barbarous music. Each village worked at day, and sometimes at night to finish their marked-out task. They all seemed merry and contented. They were paid of course for their work, the lambardár's receipt taken, and in two or at most three days they were at home again.

Too much stress cannot be laid on the advantage of the laborers having a defined job of work set out for them, so that they may be certain that the length of their attendance is entirely dependent on their own exertions—and this is a permanent feature in the *dak* system.

But the peculiar nature of canal clearances requires, in my opinion, some further elaboration of the system described by Colonel Grey.

The bulk of the silt clearance is, and always must be, at the head, that is, in the first two miles from the river, where the heavily-silted river-water changes from the rapidly-flowing flooded river to the slow current of the canal. In this neighbourhood there is little or no irrigation, the main block of irrigated lands lying miles lower down the canal.

Not only is the silt in much larger quantity near the head of the canal, but its clearance involves a much higher lift, as the canal is here in its maximum cutting. Thus, some of the labor of the irrigating villages lower down must be brought up many miles, and the labor involved to bring a *dak* of work to bank may be double that of a *dak* lower down where the banks are not so high; therefore, merely dividing the cubical contents of the earth-work by the number of irrigated acres will not give a fair proportion of *work* to each acre.

These two items* have to be taken into consideration—

(i) Distance of laborer from his work when more than three miles.

(ii) Length of level, reckoning, as usual, 10 feet horizontal to 1 vertical. There are many ways of adjusting this, but is too important to be lost sight of in any code of rules that may be framed for what I may call "statute labor job-work."

In the *cher* system a certain number of "days" were reckoned to the laborers who came from a distance.

I have said above that, in my judgment, there can be no two opinions as to the advantages of Colonel Grey's *dak* system over the *cher* system as now worked on the inundation-canals; but, though I know from experience that it is to be preferred for canal clearances, on which the work to be done is susceptible of accurate measurement, I still think the old *cher* system is a sound and good system if worked with ordinary intelligence, and is more applicable than the *dak* system to the miscellaneous works of improvement and periodical repairs.

The *siwáis* (hateful word to the lambardár) are a notorious source of irritation and grudging and the hard cash wrung from the peasant is but as a drop in the bucket to the pressing demands on the Deputy Commissioner, who is chronically bankrupt in the matter of district funds.

Roads made and planted all over the Punjab, instead of improving with the confessed prosperity of the country, are in very many instances now impassable, and every tree dead.

How little strain on the internal economies of the village would it be to say "Your road cess is abolished, but such and such lengths of road adjacent

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* As regards (I) I may note that it is the universal practice of villages whose *daks* be inconveniently distant to give them on contract to villages more conveniently situated.

As regards (II), allowance is always roughly made in giving out the *dak*. For instance, if a *khaonti* (length between two sets of bench-marks) in the first two miles of a canal contains 30,000 cubic feet of excavation, it would be allotted to a village whose *dak*, by the acreage rate of cubic feet on irrigation, amounted to 36,000 or 37,000 cubic feet. This is well understood and regularly adopted.—H. GREY.

to your village must be brought into proper section once a year, and every tree that dies you will replace," and so on for the periodical repairs of civil buildings requiring other than skilled labor.

To summarise the above remarks—

I think the *dak* system as described and worked by Colonel Grey as almost perfect for canal clearance; but, in asserting this, I should be most unwilling to say anything against ordinary commercial labor as used successfully in our own Colonies, in Belgium, and in France.

A system, *any* system, of labor to be provided by the farmer when his laborers and cattle are or would be idle, for improvements in his own immediate neighbourhood, is, and always must be, in a poor country, far more tolerable, far more efficient, than the continual demand for hard cash by the tax-gatherer.

C.

Memorandum by Babu Mya Das, *Extra Assistant Commissioner, dated Fázilka, 6th March 1883.*

The last five or six years' experience tells me that "the work allotted" to the *ábnosh* villages by *daks* is, in practice, exacted only from the men interested in the irrigation and in *proportion* of their interest, as the following explanation will show:—

When the clearance or other work is allotted to an *ábnosh village* as a whole, the proprietor or proprietors call all the tenants or sub-tenants together; and, as all these persons interested in the irrigation are present when the patwári measures the irrigated area, they all know how much land of each cultivator has been irrigated, and accordingly they distribute the work among themselves, with which of course the canal official has nothing to do, unless a dispute arises between the cultivators and the proprietor, in which case reference is made to the patwári's paper, who has a detailed account of irrigation in his *shajra khasra*, expressly prepared for the purpose under orders of Colonel Grey, the then Deputy Commissioner of Ferozepore. As to *kamíns*, it is a common thing that each proprieter or a well-to-do cultivator has two or more *kamíns* or *adhjogias* (co-sharers in cultivation) who are bound to work with him for their own interest; but it must here be stated, whenever the work is unusually heavy —which however, is not the case now, there being only the annual clearance to be done, the proprietors and tenants join together and take almost everybody in the village, and get through their task as a joint work; and of course there is some possibility for grumbling for some of the people of the village who may not be interested *directly* in the irrigation; but it is a *universal* rule established from old days that when a house for travellers is to be built, or any other common object in which all the villages are interested, more or less everybody is called out to give a helping hand, and indirectly *every soul* in the village is interested in the irrigation. The *kamín* gets so many more seers (per maund) of the produce yielded through irrigation; even those who keep sheep and cattle are interested, as in several places they had to go away for ten or more miles to neighbouring villages for water. I have known as a fact that some villages in *Rohi* have carried water on bullock-carts from these canals for their daily use. In short, so far as I am aware, the system of allotting a *dak* to an *ábnosh village* and letting them settle their details among themselves is by far the most practical and just than any other system of local irrigation known.

No. 2658, dated Lahore, 24th March 1883.

From—F. C. Channing, Esquire, Senior Secretary to Financial Commissioner, Punjab,
To The Commissioner and Superintendent, Mooltan Division.

Is directed to forward, in original, for circulation to Deputy Commissioners of Mooltan and Muzaffargarh, a letter, No. 48 of the 7th current, from the Commissioner, Hissár Division, submitting a memorandum, together with a note in original, on the *cher* and *dak* systems of canal clearance, and requests that it may be returned, with his reply to this office No. 1831 of the 23rd February last.

No. 697, dated 9th June 1883.

From—Colonel E. P. Gurdon, Officiating Commissioner and Superintendent Mooltan Division,
To—F. C. Channing, Esquire, Senior Secretary to Financial Commissioner, Punjab.

As requested in your letter No. 1831, dated 23rd February last, I have the honor to submit, in original, the reports of the Deputy Commissioners of Mooltan and Muzaffargarh, together with the reports of the Canal Officers, on the *cher* and *dak* system of canal clearance.

The original enclosures of your No. 2658 of 24th March last are herewith returned.

No. 121, dated 6th April 1883.

From—C. E. Gladstone, Esquire, Deputy Commissioner, Muzaffargarh,
To—Colonel E. P. Gurdon, Commissioner and Superintendent, Mooltan Division.

I have the honor to forward copy of letter No. 117, dated 2nd April 1883, from the Executive Engineer, Muzaffargarh Canals, with reference to your circular No. 61, dated 2nd March 1883.

I do not think the Executive Engineer lays sufficient stress upon the distinction between the *dak* system and our present system. The essential difference, as understood by the zamíndárs, is this. The *dak* system takes a village or group of villages as the unit, and does not take the individual into consideration. The system we have takes the *chera* as a unit.

Mr. Sibold rightly says the *dak* system is no new thing here; it is well-known in the district. The villagers would in many cases like to bring this system into use. It is, however, quite unsuited to this district. The *dak* system can be put into force in special cases here of course, but it would not do at all to bring it into force as a rule. The *dak* system is admirably adapted for a canal district in which the alignment of canals and their levels is satisfactory, and therefore no change is contemplated. All that has to be done in such a case is simple maintenance. Every one knows what has to be done, and each village or group of villages has about the same work to do every year. The *dak* system would suit such a set of canals admirably. It would also suit a set of canals which, though defective, suited the zamíndárs, and in the construction of which no change was contemplated.

But in this district the case is not so. Mr. O'Brien states in his Settlement and Assessment Reports that he was unable in many cases to assess at full rates because the canals had worked so badly that the people were nearly ruined by successive failures of irrigation. A great difficulty that has to be contended with is the natural selfishness of the men of each village. They wish the canal to be within easy reach, and therefore they have been made to wind about from one village to another instead of being straight. They wish to have their fair share of clearance, whether they want it or not, and thus dig down into their canals and ruin the slope and flow, though no clearance was required.

The Executive Engineer, wisely as I think, has worked hard to put the alignment of the canals and their levels on a proper footing, and has expended much of the labor at his disposal on completely clearing out the creeks from which the canals take off. Improvement in the alignment of canals, clearing out the creeks, and making escapes which were badly wanted, takes the people far from their homes. This makes such work unpopular, for a simple villager does not fully appreciate the value of an escape which benefits the whole district generally, but not perhaps appreciably his own village. He cannot, while on such work, get food from his own house or sleep at home. Still, works for the general advantage of the district cannot be neglected, escapes must be dug at great expense of labor, and creeks must be cleared out. It is obvious that the *dak* system would not do here. It would not be fair to send entire villagers away to work at a distance while others quietly worked near home. The only system that can be advantageously worked while canals are being gradually improved is the *cher* system, taking the *chera* as a unit. I admit that this last system is liable to great abuse owing to the corruption and carelessness of underpaid subordinates, many of whom are mere temporary hands. This year there

have been great complaints. I have not yet completed my enquiries, but I think the system has not worked quite so smoothly as it should have done. This is a fault in the working of the system, not in the system. There is considerable clumsiness in the arrangement by which administrative work is given to the Canal Officer, who should be a simple Engineer. Canal officers in India are anomalies—partly Engineers, partly Revenue Officers.

In this district a Tahsíldár has no means of checking the demand for *chers* made by the Canal Officer. The Tahsíldár checks the patwárís' papers as to cultivation, and these are the basis on which the Canal Officer prepares his *cher* demand. But the Tahsíldár knows nothing about the principles on which the *cher* demand is made out, and whether the amount of *chers* called out is correct or not. The Deputy Commissioner has no check in his office either, and can only check the *cher* demand by sending for the papers from the Canal office. The district officials and zamíndárs are therefore in the dark as to the correctness of the *cher* demand and the distribution of the *cher* labor. They know what the Canal Officer demands, but they do not know why he demands it. I think this is what makes them so ready to complain that the demand is excessive, and that the distribution of *cher* labor is not fairly worked. The *cher* system will not work as it should until all revenue and administrative work is put into one office, and the *ábnoshes* associated with the working of it. This, I hope, will be done before long. The system will then work well; at present there are defects in its working, though I do not think any other system practicable in the district at present.

About bench-marks, that is an engineering question which I must leave to the Executive Engineer. I note that that officer estimates the cost of putting up these kíkar stakes at Rs. 35,000. This sum we certainly could not afford.

I quite agree with the Executive Engineer that it is by no means necessary to clear all the canals every year. Some of them have too low a level as it is. Of course zamíndárs wish to spend their labor on their own canals, and do not like to see them neglected while they go to work elsewhere. But to give way to this natural human feeling would be to waste labor, money and time; and I think the Executive Engineer quite right not to yield on this point.

I do not recommend that the system of Baháwalpur be introduced. There is nothing new in it, and it has simply not been introduced because it does not suit the district. If something could be done to make the working of our system less clumsy—and this I have written about elsewhere—it would be highly desirable.

Copy of a letter No. 117, dated 2nd April 1883, from E. A. SIBOLD, Esquire, Executive Engineer, Muzaffargarh Canals, to C. E. GLADSTONE, Esquire, Deputy Commissioner, Muzaffargarh.

I have the honor to acknowledge receipt of your No. 212, dated 20th instant, forwarding correspondence on certain canal arrangements in the Baháwalpur State, and asking for my opinion on the suitability of similar arrangements for these canals.

2. The points are:—

1st.—The *dak* system, which is the same as task or piece-work.

2nd.—The saving of annual levelling by putting in stakes of kíkar at every half-furlong.

3. The *dak* system is well known on these canals, and is often resorted to. In practice, the task may be given out by the day, the week, the month, or any other period. When the task is for a long period, the penalty for not doing it is a fine on the defaulter of double the amount at which his task is auctioned. Half the amount is paid to the man who takes over the task, and half to the *zar-i-nágha* fund. Where it is feasible to carry out the *dak* system for a long period it saves labor to the Canal establishment, and enables the people to work when and how they like. But in the Baháwalpur State a certain amount of work has to be done by the people, and the question is to make all share alike in the work. Here the *chers* are a fixed quantity, and the question is to fix what is a fair day's work for all the varying cases of lead and lift and

state of stuff to be excavated. Here the *cherguzár* has to get done the task fixed as a day's work multiplied by the number of *chers* he is assessed at, and the *zar-i-nágha* fund has to bear the cost of completion if the *cher* work is not sufficient to do so. The difficulty on these canals is therefore to fix the unit of labor, for the smaller it is, the less the *cherguzár* has to pay his *cher*.

4. Wooden kíkar stakes for fixing levels of canal-beds were used on the rajbaha beds of the Bári Doáb Canal when I joined that canal in 1864. The usefulness and durability did not compensate for the labor or cost of fixing them. In the correspondence it is stated that the fixing of levels for 642 miles of canal cost Rs. 23,248, so at the same rates the cost for the 900 miles in this district would be Rs. 35,000. Moreover, we are in this district only gradually finding out the best working-levels for the different channels. All the more important channels are being gradually provided with masonry bench-marks at 5,000 feet intervals (about 100 miles will be so provided during present working season), but their only object is to reduce levelling work to a minimum, and to act as checks. Even if these canals were remodelled, it would be, in my opinion, cheaper to resort to levelling where necessary than to incur the cost of fixing and maintaining a multitude of marks.

5. I would beg to point out that it is a mistake to suppose that silt clearances is the one important question on inundation-canals. It is certainly not so on these canals. There is even now on these canals a lot of useless and worse than useless silt clearance, but I can only remedy this gradually. In ordinary years the aggregate quantity of water entering all the canals would probably suffice for three or four times the present irrigated area, but the difficulty is to put it where it is wanted, and take it away from where it is not wanted. I can point to channels in this district in which the silt clearance question need not be raised for years together.

Appendix to No. 121, dated 6th April 1883, from C. E. GLADSTONE, Esquire, Deputy Commissioner, Muzaffargarh, to Colonel E. P. GURDON, Commissioner and Superintendent, Mooltan Division.

I have the honor to inform you that I had unfortunately written my report in answer to your circular No. 61 of 2nd ultimo before I received your circular No. 84, dated 3rd April; but I append my remarks on Colonel Grey's memorandum herewith, and attach it to the report, which had not yet been sent off.

The *dak* system, as I have said in my previous report, is an excellent one if existing canals are to be simply maintained; but where they are being gradually improved and the work does not remain of the same nature, and, further, drainage-works benefiting the district generally must be constructed, I do not see how Colonel Grey's system could be carried out.

I quite agree with most of what Colonel Grey says. The *cher* system has many faults, and I will take those pointed out by Colonel Grey in order. I have from my experience in camp during the past marching season come to the conclusion that our *cher* system is not working smoothly, and that there is probably some oppression going on. I have started an enquiry into the matter, and am unwilling to say more until I have more facts to go on. It must be remembered that I have only had one camping season in Muzaffargarh. That our present system in Muzaffargarh is not popular I have ascertained, but I think I shall show that this is owing to faults in the working of the *cher* system, not in the system itself. The canal system in its relation to the Deputy Commissioner is clumsy, and would not work if the officers did not try hard to make it work. I think I shall show that it is the clumsy arrangement of making the Executive Engineer partly a Revenue officer, and partly an Engineer responsible to his own department, that prevents the *cher* system working. The Deputy Commissioner and his Revenue staff supply the Executive Engineer with figures showing the cultivated area in each village. The Executive Engineer considers whether the Settlement *chers* are enough; if not, he asks the Deputy Commissioner for more. If he gets these, he has to add them to the Settlement *chers*, and then distribute the *chers* according to the cultivated area. He then prepares the papers show-

ing what *chers* are allotted for each well or patti, and the men are called out by him. The Tahsíldár does not know if the number called out in his tahsíl is the sanctioned number, and the Deputy Commissioner has no check in his office. He can only find this out by asking the Executive Engineer to send him all the distribution papers from his office. The detail of carrying out the work by the *chers* is really subject to no check by the Deputy Commissioner. It is entirely carried out by the Canal Officer by means of hungry, temporary moharrirs and sarpanches, who do not represent the people. This is all quite wrong. My proposals in connection with the management of the canals through the Local Boards would remedy this. The Deputy Collector, now under the Canal Officer, would be put under the Deputy Commissioner, and all the existing staff, except Engineering staff, would be also made over to the Deputy Commissioner too. The Local Boards would be elective and representative bodies, and the Central Committee would be composed of representatives of the Local Boards. The Central Committee (a third-class Board) would fix the number of *chers* to be called out for the whole year after examining the Executive Engineer's proposals of necessary works and the patwárí's papers showing cultivation. They would according to cultivation allot the number of *chers* for each village, and settle where they were to work. The Deputy Collector and his staff would then have to sub-divide the *chers* of each village among the wells and pattís according to cultivation. The Local Boards would be asked to look after this, and also especially to supervise the actual distribution of work and the way it worked in practice. The absentee rolls to be kept as now, but the sarpanches to be elective for three years and real representatives of the *abnoshes*; the moharrir to be a mere moharrir. The Local Boards to carefully supervise the work of the sarpanches and moharrirs, and report all irregularities. All works considered feasible by the Executive Engineer to be sanctioned as follows:—

		Rs.
Deputy Commissioner	... up to	10,000
Commissioner	... ,,	25,000
Financial Commissioner	... beyond	25,000

provided the Central Committee allot the funds. No departmental sanction to be required. Local Boards to be benches of Honorary Magistrates for Canal offences.

Colonel Grey's first objection is to the way the number of *chers* is fixed. In the district of Muzaffargarh the plan he complains of has never been adopted. The number of *chers* was fixed at Settlement for five years, but I am bound to say that it has never sufficed, and that more *chers* have always been called out. This would, however, be obviated by my plan of the Central Committee, themseves *ábnoshes* and elected representatives, allotting the number of *chers* every year according to the necessities of the year, having before them the Executive Engineer's and the Local Board's proposals and the Patwárí's papers.

Colonel Grey's system of calculating the work for each village on the *dak* system seems to me perfect, but I do not think that system would do with us. If we introduced it, we must give up all improvements, which I shonld deprecate.

Mr. Elliott's quoted objection to the *cher* system does not apply here. Our *chers* are fixed for five years, and we only exceed the grant of *chers* when any urgent work appears necessarry *e.g.*, the clearance this year of the Magassin creek, which had been choked up by the floods of 1882.

I would never willingly allow a *pancháyat* or any local body to fix the number of *chers* for any village; this should be done by the Central Committee representing the whole district.

With regard to Colonel Grey's objections to the mode of working, I am afraid there is only too much truth in them. But the discomfort unnecessarily caused to the laborers would not be caused if my plan for management of the canals, in a great measure by the people's representatives, and bringing all adminstrative work into one office under the Deputy Commissioner, were carried out. I fear that a good many laborers died this year on the Maggi creek from want of shelter and fuel.

I never heard, however, that the people could tell how much was silt and how much natural bed. The Executive Engineer is responsible for marking off the work and showing what has to be done, and what is a fair day's labor for one man.

In fixing this fair day's labor I fear much hardship has been caused this year. The people complain (though I will not yet say with truth) that the daily task given takes two and even three days. This is an exaggeration probably, but I expect there is some truth in it. I am enquiring. The fact is that, though the Executive Engineer is the only proper judge of whether the work in complete or not, and tasks must be set to prevent idleness, he has not now time to go about and see to this properly; more than half his time is taken up with doing the work of a draftsman and other office-work. All this should be reduced to a minimum. The Executive-Engineer should be an Engineer and not a Revenue officer, and in a simple district like this he should be considered a competent judge on engineering points. At present he has to send every petty project up for sanction, and invariably the project comes back with a list of questions which have, some of them, either been answered before or should have been asked before *e.g.*, there is a most important project pending, the Kot Sultán head of the Din Muhammad. This is now the third year, and the project, though most important, has not yet been sanctioned. In 1882, when I hoped sanction would have been accorded, the project having been long pending, I received a list of questions through the Executive Engineer, one of which was whether the Deputy Commissioner approved of the scheme; another, what acreage the projected work would water. Now, these questions should have been asked before, and not at so late a stage. The people have become quite disheartened about new projects, and the Executive Engineer's time is taken up needlessly. If he was relieved of all unnecessary office and revenue work, he would have ample time to see what quantity of work would have to be done, what number of *chers* would be required, and afterwards whether the work had been completely done. At present much of the work must be left to subordinates, who doubtless fill their pockets.

Colonel Grey objects to the power given to a moharrir of taking down each *chera's* name, and recording men absent and present. I quite agree. The arrangement is bad.

Colonel Grey objects to the accumulation of the *zar-i-nágha* fund. I quite agree. It is quite absurd to hoard it in this way when it is badly wanted for urgent works. But the reason of its being hoarded is the hard-and-fast system of the Canal Department which makes it so difficult to get any new work, however necessary, sanctioned without an amount of correspondence which shakes the nerves of even the most stout-hearted.

Colonel Grey objects to moharrirs being temporary, and says they would work without pay willingly. I am afraid they would at present, but they would not do so if the representatives of the people had a part in the arrangements. The difficulty then would be to get temporary moharrirs, as it would not pay. I should say this would be all the better, for the system of having temporary moharrirs is bad altogether.

As to the *zar-i-nágha* going to a fund, and the *chers* present having to do the absentees' work, it is to be remembered that the *chera* who is present is paid part of the fine. The absentee is fined double. I had to tell the Executive Engineer this year that overtasking the *cheras* who were present would stop them turning out next year.

Colonel Grey quotes Mr. O'Brien saying that the system in Mooltan is unfair, wasteful and inefficient.

In Muzaffargarh it is not wasteful nor I think inefficient, as far as the Executive Engineer is unfettered by his department. That it is at times unfair, I fear, is true. But this is because the Canal Officer is made into a Revenue Officer and overburdened with useless office-work.

I have proposed in my previous letter that the Central Committee might apportion some of the work to *daks* if circumstances admitted of it.

But I am against the *dak* system being introduced universally. It would stop all improvement, and it would deprive us of the *zar-i-nágha* fund, which should be spent on useful works, and not hoarded. We cannot do without some fund.

The *cher* system as worked in this district cries out for reform, but I would earnestly recommend that it should not be abolished. Where work can be done by *daks* it should be, but we cannot do without the *cher* system.

No. 186, dated 17th March 1883.

From—E. O'Brien, Esquire, Deputy Commissioner, Mooltan,
To—Colonel E. P. Gurdon, Commissioner and Superintendent, Mooltan Division.

In reply to your Circular No. 61 of 1883 and enclosures, enquiring whether the existing system of clearance of canals can be improved by the introduction of the *dak* system, I have the honor to forward, in original, a letter, No. 449, dated 16th March 1883, from the Executive Engineer, Lower Sutlej and Chenab Canals, on the subject.

2. The *dak* system has been tried occasionally both in Muzaffargarh and in Mooltan, and, as far as I know, has generally been productive of hardship. There are great faults in the present system of clearances, but I do not think that it has been established that the *dak* system would be an improvement. The Baháwalpur Report is eleven years old. The system had then been but recently introduced, and sufficient time had not elapsed to show that it would continue a success. We do not know whether it is in force now. It is a system that is possible only where the canal administration is directed by absolute power. I see no reason to recommend that the present system be abolished.

No. 449, dated 16th March 1883.

From—W. Stevens, Esquire, Executive Engineer, Lower Sutlej and Chenab Division,
To—The Deputy Commissioner, Mooltan.

I have the honor to acknowledge receipt of your No. 366, dated 10th instant, with its enclosures (which are herewith returned as requested), on the subject of the *dak* system for clearance of canals.

2. The system is not unknown in this district, and I believe that it has not unfrequently been resorted to when emergent works (such as digging new heads towards the close of a season) have been necessary. On such occasions the results have usually been satisfactory, and, judging from the frequent requests made to me by the Munsiffs to dig new heads or improve the canals by *dak*, I should imagine that the system would be generally approved of by the irrigators. It, however, has never, that I am aware of, been applied to canal clearances in this district, but, as it has succeeded so well in the Baháwalpur State, I do not see why it should not succeed equally well here—provided, of course, the same attention is paid to the details.

3. It would be satisfactory to know by whom, and in what way, the cubic contents of clearances were estimated, and what amount of subordinate official agency was employed to distribute the work; whether the arbitrators were remunerated in any way; and if so, how? What penalties were enforced upon the landholders who failed to complete their portions, and what was the procedure for recovery of the penalties? The number of men required for a canal would, according to the Report, vary annually, *i.e.*, according to the amount of work to be done. Were the assessments made upon the areas cultivated in the previous season; if so, by what date were the clearances commenced?

4. By the *dak* system the landholders, and not the cultivators, are the persons made responsible for the execution of the work, and upon them the penalties are imposed. This is contrary to the present practice in this district, but, in my opinion, it is a necessary part of the *dak* system. Whether the change would be approved of by the landholders of this district, is a question.

5. The staking of the canal-beds is also, of course, necessary as otherwise it would be impossible to ascertain with sufficient rapidity the quantities of

clearance annually required. I believe that the beds of the Mooltan canals have all, to a certain extent, been staked, but not with stakes of such large size as mentioned in Mr. Barns' report, and they would require to be carefully done again. Masonry bench-marks have also been built on many of the canals at 5,000 feet intervals, but I am afraid that a good many of those built have been destroyed.

6. There is no doubt, I think, that the *dak* system has some advantages over the present *cher* system in force in this district. For one thing preparation of *asámiwár* lists would be unnecessary, as it would only be necessary to know the names of the landholders; and, to quote the words of the Report, the curse of temporary supervisors (moharrirs), who do, no doubt, practise extortion upon the *chers*, whould be avoided. Further than this there would be no occasion for preparation of *zar-i-nágha* statements and for collection of the same. For the system to succeed, however, the penalties must be very severe and be inflicted in a summary manner. If notices have to be issued and regular investigations made and appeals allowed, then, in my opinion, the work would never be done.

No. 7904, dated Lahore, 6th September 1883.

From—F. C. Channing, Esquire, Senior Secretary to Financial Commissioner, Punjab,
To—The Commissioner and Superintendent, Mooltan Division.

With reference to your No. 697, dated 9th June, I am directed to enquire whether, under the powers given by No. 23 of the Mooltan *cher* rules, and 17 of the Muzaffargarh *cher* rules the Divisional Canal Officer is held entitled to direct a *cher* laborer to attend in whatever part of the district the Canal Officer considers that his labor is required, or whether the liability of a *cher* laborer is considered limited to working on his own canal, or (in cases where canals are grouped together) on his own group of canals. The replies should deal separately with the two questions of—

(A) What the legal liability is considered to be?

(B) What the existing practice is?

Copy of a letter, No. 712, dated 15th October 1883, from E. O'Brien, Esquire, Deputy Commissioner, Mooltan, to Colonel E. P. Gurdon, Commissioner and Superintendent, Mooltan Division.

In reply to your Circular No. 200, dated 11th September, and enclosure, I have the honor to state that in this district, since British rule began, the liability of a *chera* to work has been limited to his own canal or group of canals. There is nothing in the Canal Act or rules, or in the Settlement record, to make a *chera* work on a canal with which he is not connected, nor is he required to do so by custom. It is not the practice in this district to make the *cheras* belonging to one canal work on another canal which is not connected with it.

Copy of a letter No. 323, dated 14th September 1883, from C. E. Gladstone, Esquire, Deputy Commissioner, Muzaffargarh, to Colonel E. P. Gurdon, Commissioner and Superintendent, Mooltan Division.

In reply to your Circular No. 200 of 11th September, I have the honor to state that I am of opinion that, as a rule, the *chers* should only be employed on their own canals or on their own group of canals. But I think that to meet exceptional cases the same rule might fairly be made that is in force with regard to 4-anna *chers*. They might in cases of necessity be employed elsewhere by the Executive Engineer with the sanction of the Deputy Commissioner.

The custom of late years has been for the Executive Engineer to send them to strange canals if he thinks fit. This has, I think, caused great hardship.

Endorsement by Commissioner, Mooltan, No. 1207, dated 17th October 1883.

Copy of the foregoing forwarded to T. G. Walker, Esquire, Senior Secretary to Financial Commissioner, Punjab, in reply to his No. 7904, dated 6th ultimo, and states that Commissioner is of opinion that the practice in Muzaffargarh of employing *cheras* on canals with which they are unconnected seems very objectionable and illegal, and it is one of the grievances complained of by the Muzaffargarh people.

No. 10183, dated Lahore, 6th December 1883.

From T. G. Walker, Esquire, Officiating Senior Secretary to Financial Commissioner, Punjab,

To—The Commissioner and Superintendent, Mooltan Division.

With reference to the correspondence relating to the employment of *chers* in the Mooltan and Muzaffargarh districts which ended with your letter No. 1207, dated 17th October 1883, I am desired to say that the Financial Commissioner is inclined to think that orders should be issued forbidding the employment of a *chera* away from his own canal or group of canals; but, before this is done, Colonel Davies would like to have your opinion, and those of the Deputy Commissioners, Mooltan and Muzaffargarh, as to whether such an order would cause much inconvenience in the administration of the canals.

No. 332, dated Hissár, 28th December 1883.

From—Colonel L. J. H. Grey, c.s.i., Commissioner and Superintendent, Hissár Division.

To—F. C. Channing, Esquire, Senior Secretary to Financial Commissioner, Punjab.

The remarks of the Financial Commissioner in paragraph 18 of Punjab Revenue Report point to an approaching reconsideration of the existing system of statute labor in force on the Muzaffargarh and Mooltan canals, and of the method of management of these canals.

2. The proof-sheets of the Canal Manual forwarded with my No. 55A. of 16th March are now with me, and when this is published it will afford guidance for the adoption, if desired, of the system of labor which works well on the Baháwalpur and Ferozepore canals since introduced by me there in 1871 and 1874 respectively. In the memorandum accompanying my No. 48 of 7th March 1883, I contrasted the two systems at length, and showed the great disadvantages of the *cher* system as compared with mine, which may be called the *dak* system. Nothing, however, that I could say can be more condemnatory than the facts stated regarding *chers* and *zar-i-nágha* by Mr. Gladstone at pages 131-2 of the Appendix to the Revenue Report above quoted, and those given by Mr. O'Brien at page 118 of the same.

3. Conceive a system under which the demand for *zar-i-nágha*, or fines on absent *chers*, *intended by the theory of the system to be spent on substitutes*,* amounts for one year to Rs. 62,298, while the work of the absentees has to be done by the *chers* who are present, *in addition to their own*,—where that fund amounts to lakhs, as stated by Mr. Gladstone,—where these fines are assessed by moharrirs employed temporarily to keep the roster of attendance, of whom it is sanguinely hoped that they are honest, but who cannot be checked! Mr. O'Brien writes—"It must be remembered that the persons responsible for assessing this are moharrirs employed temporarily who keep the roster of attendance. It is difficult to check their work. A very large number of petitions of objection is the result, and each petition comprises a number of points. Irrigators can object . . . . . . to the non-attendance *alleged against those laborers, and finally to the amount of zar-i-nágha debited.*" On this head Mr. Gladstone observes:—"This very delicate work is done chiefly by temporary moharrirs aided by sarpanches, who by no means always represent the people, and are not always land-owners. I hope these men are honest, but the impression of the people is that *money judiciously spent will make absentees present* and fling an extra amount of task labor on men who are really present."† I have pointed out (paragraph 7 of memorandum accompanying my No. 48 of 7th March 1883) that these moharrirs are paid Rs. 15 per mensem only for the period of clearance, and live all the rest of the year on what they then earn; and that they are "glad to take the posts without salary at all, and would even pay for them into the bargain. This, as a fact, they generally have to do."

4. But it is needless to pile up the indictment against the *cher* system as now worked in Mooltan and Muzaffargarh. Mr. Palmer, in his memorandum accompanying my No. 48 above quoted, regards the faults on which I dwell as not belonging to the system itself but only to our way of managing it. The result is the same; the excellence of the theory is of little value if "monstrous

* Mr. Palmer, in Appendix B. of my No. 48 of 7th March 1883, speaks of "the monstrous abuse of hoarding up the fines for non-attendance; the very essence of the justice of these lay in the money being spent at the place where it was levied and when it was levied."

† This impression is a well-known *fact*.—See paragraph 3 of my No. 48 of 7th March 1883.

abuses" result in practice. But even when the *cher* system is taken at its best there cannot, as Mr. Palmer writes (paragraph 1 of memorandum), be two opinions on the merits of the two systems"—*viz.*, that of *cher* and the one introduced by myself. The latter is theoretically simple, and as satisfactory in practice as it appears in theory. Therefore I trust that, in the consideration of this matter on the report since furnished by Mr. Gladstone, it may be determined to introduce the Ferozepore system on the Mooltan and Muzaffargarh canals.

5. But I venture to hope that, at the same time, the much-wide question raised in my No. 55A. of 16th March 1883 may receive attention.

I therein pointed out that under the Ferozepore system, as detailed in the Canal Manual which will shortly appear (paragraph 8 of Punjab Government Resolution No. 256 of 15th November 1883), inundation-canals are managed at one-fourth the cost of those under the Public Works Department, and that they make constant progress under district management, whereas under the Public Works Department "no improvements are effected, and no developement made," and thus "there is no return whatever for the extra cost of their management."

6. For the reasons of this state of things I quoted Mr. Roe (pages 843 and 859, volume II, Punjab Famine Report of 1878). On this head I would also call attention to Mr. O'Brien's remarks at pages 117-18 of Appendices to Punjab Revenue Report, 1882, where he writes that in Mooltan it takes six years to make an irrigation-cut from a canal and two and a half years to put up a *jhalár* thereon! But Mr. Gladstone's remarks alone (pages 130 of Appendices to Punjab Revenue Report) should suffice to support my position. I endorse every word that he says there; and his observations on the next page, regarding the qualifications required for management of inundation-canals, are true to the letter. I quote them below, for consideration in connection with paragraphs 7, 8 and 9 of my No. 55 A of 16th March 1883:—

"Inundation-canals are very simple where they are understood, but they require the experience of years. A simple Engineer is sure to make mistakes with them at first. Even where *a man has learnt inundation-canals, I defy him to settle every difficulty in relation to any particular one of them without seeing the spot, or being previously acquainted with it.* To deal with inundation-canals, a man must be always on the spot, must be thoroughly acquainted with the practical geography of his circle, and must learn that rules of hydrodynamics cannot be always applied to the Indus. He must, in fact, to a certain extent forget that he is an Engineer, and *he must acquire an instinct.* To deal with inundation-canals he need not be able to say why he cuts a head in a particular place; he must feel why he does so."

7. In conclusion, it may seem a bold proposal, but it is one which I have well considered for years, when I state my opinion that, if successful management and progress of irrigation be desired, the Punjab inundation-canals should all be brought under district management on the system described in my Manual of Canal Irrigation.

Memorandum on the correspondence relating to the *Cher* and *Dak* systems, by Lieutenant-Colonel L. J. H. Grey, c.s.i., Officiating Commissioner, Hissár Division.

I may as well clear up one or two misapprehensions into which I see that the Mooltan and Muzaffargarh officers have fallen.

(1) The cost of bench-marking is estimated by Mr. Sibold at Rs. 35,000 for 900 miles of canal in Muzaffargarh, or nearly Rs. 40 a mile. He derives this from Mr. Barns' statement of outlay of Rs. 23,247 on $641\frac{1}{2}$ miles of canal in Baháwalpur. But Mr. Barns quite needlessly charged thereto the salaries of establishment, surveyors and other servants of the State who were receiving pay in any case, whether they did this work or not; and he charged Baháwalpur rates for everything, which are rather more than double the rates at which everything can be done in Ferozepore and Sirsa, and presumably therefore in Mooltan and Muzaffargarh.

It is needless to explain why a Native State like Baháwalpur has to pay enormously when once it takes to paying at all. Suffice it to say that its rates

are no criterion for those of British districts. We buy *kikar* stakes at the contract rate of an anna each (as stated in Canal Manual); the levelling is done by the paid servants of the irrigators; and the carrying and laying down of the stakes, by the irrigators themselves. There are 48 stakes to a mile of main canal, one in the centre and one at each side, at each half-furlong, representing a cost of Rs. 3 a mile; and the life of good *kikar* stakes is found by experience to be six years—thus the bench-making of main canals costs 8 annas a mile per annum. In distributaries there are only six stakes per mile (in the centre only), so the cost is 2 annas 8 pies per mile *per annum*. Mr. Sibold has lumped together main canals and distributaries to make up his 900 miles of Muzaffargarh canals. The *pakka* bench-marks on the banks at each 5 miles cost Rs. 2-8 each, and they require no renewal, being blocks of concrete sunk in the earth. They cost Rs. 2 each, say with carriage 8 annas a mile, once and for all. The cost of the mud pillars and bricks on the banks marking the mile and number cannot be stated accurately but may be taken at as much more. Thus the Muzaffargarh canals could be bench-marked throughout for Rs. 3,000 instead of Rs. 35,000 as supposed, and the maintenance would be under Rs. 500 a year.

(2) The *dak* system is just as applicable to new work as to clearance. This is fully explained in the Canal Manual. No other system has been employed for new work in Ferozepore for eight years past, and such new work is *constantly* in hand. In fact, as pointed out in my No. 55 A of 16th March 1883 and my No. 332, dated 26th December 1883, it is the great advantage of District management over Public Works Department management of district inundation canals that the former, being untrammelled, is constantly* making improvements, whereas the letter requires, as pointed out by Mr. O'Brien, six years to make an irrigation cut and two and a half years to put up a *jhalár*. Thus, it is very far from being the case, as supposed by Mr. Gladstone, that if the *dak* system be adopted "we must give up all improvements." He may be quite sure that improvement will proceed much faster when the people are satisfied with the justice of the system whereby the work is distributed then when (as under the *cher* system) all are in the dark and each supposes that he is being put upon.

(3) Mr. Gladstone says that "we cannot do without some funds." No system of district canals can do without such, and yet Ferozepore has no *zar-i-nágha* system. A fund can be obtained in an equitable manner by a *bachh*, or rate on irrigated area, just as easily as by what Mr. Palmer terms the "monstrous abuses" inherent in the *zar-i-nágha* system.

Mr. O'Brien and Mr. Stevens, in writing their replies, dated 16th and 17th March, had not seen my No. 48, dated 7th March 1883, subsequently circulated. The memorandum attached to that letter would have removed the misapprehension under which the former wrote his answer; and would have satisfied the queries contained in paragraph 2 of the reply of the latter.

OPINION ON THE COMPARATIVE MERITS OF THE CHER AND DAK SYSTEMS.

Copy of a letter No. 269, dated 17th March 1884, from S. S. Thorburn, Esq., Deputy Commissioner, Dera Ismail Khan, to the Senior Secretary to the Financial Commissioner, Punjab.

Mr. Gladstone let me see to-day the correspondence relating to the *cher* system of canal clearance in the Mooltan Division. As settlement officer of Bannu, I had to investigate, methodise and record the various canal labour systems of that district (see Bannu Settlement Report), and in this district I have to manage a vast system of irrigation works. I therefore think that my opinion and experience may be usefully stated.

2. The main distinction between the two competing systems (*dak* and *cher*) seems to be, that under the former the administrator, whether district officer or political agent, in theory only directly supervises allotted work down to the *dak* or task-book of a group of land-holders, be they one estate or several; but under the latter down to each individual laborer (*chera*). If I am correct, the manifest defects are that under the *dak* system there is no protection for the bulk of the actual laborers, who must belong to the tenant, village menial and very small self-cultivating proprietary classes, and that under the *cher* system the administrator undertakes a task which it will often be beyond his powers to perform satisfactorily. Wherever the former system can be fairly worked, it is, I think, the superior, because the less the administration interferes in small executive details, the better, and *pro tanto* the greater the measure of self-reliance and self-governing power acquired by the agricultural population. The *dak* system will succeed with a well-organised community, but where there are opposing interests and disunion it must fail in reality, although it might apparently succeed, as the poor oppressed are voiceless and cannot represent their grievances with proper weight.

* On this head the printed canal reports of 1874 to 1877 may be consulted, and the canal reports of 1880 to 1883 attached to the Ferozepore Revenue Reports.

3. In Bannu proper, *i.e.*, the irrigated parts of the Bannu tahsíl a modified *dak* system—there called "*tinga*"—is worked to perfection. Each group of the proprietary classes clear their own quantum of canal or distribution channels, jointly perform the heavier work of erecting and maintaining their head bunds and training works, and in practice levy their own dues (*nágha*) for absentees, and dispose of them too generally by feasting the actual workers. But then in Bannu the system in force has been slowly evolved in the course of two or three centuries from the necessities of the situation. In the Isa Khel tahsíl I introduced a sort of *dak* system, but subjected it to close official supervision.

4. In the *daman* of this district I may describe the system as a mixed *dak-cher* system. It is this—so many immense dams with escapes, &c., have to be maintained and re-erected, whenever swept away, over the deep broad hill-torrent beds. Each dam requires annually, say, the work of 100 pairs of oxen for from a week to two months. The quantum for each village is assessed on some prescribed equitable principle according to the benefit it receives from the dam. The lists are periodically revised. When the levy of *cheras* is called out, those present and absent are daily registered by the permanent moharrir detailed for the work, whether Patwári, or one of the regular irrigation establishment, in the presence and at the instance of the gang headmen (lambardárs generally). Absentees have to pay at prescribed rates, and when the state of the *nágha* fund permits, paid substitutes are at once entertained, *e.g.*, when the Paiwal bund has to be erected I authorized, beforehand, the expenditure of so many hundred rupees on substitutes. When *nágha* is imposed, the money is collected by the lambardárs responsible, and paid directly into the tahsíl. Moharrirs do not touch it. Thus the lambardárs, once the lists are prepared, work the system but under close supervision.

5. As to the questions of district *versus* canal departmental management, and paid or unpaid statute labor, I agree with Colonel Grey that to succeed with inundation canals it will generally be found the sounder and more economic plan to employ unpaid statute labor under district management. As to the comparative merits of the *dak versus* the *cher* system, I think the net superiority of each depends upon the local circumstances of each tract concerned; that to argue that one is absolutely preferable to the other is an idle contention; and that energy and practical sense in administration is the main desideratum. The evils in the *cher* system pointed out in the correspondence seem to me more the fault of the administration than of the system.

Note on correspondence relating to the Cher system of clearance in Mooltan and Muzaffargarh, contrasted with the Dak system in Ferozepore and Bahawalpur.

Main differences between the two systems.

1. The real difference between the two systems contrasted in the above correspondence is not that between *dak* or task-work and *chers* or daily labor, but lies in the nature of the demand made upon the cultivators. In Mooltan and Muzaffargarh, that is, under the departmental system of management, the maximum number of laborers that can be called out in one year on each canal is fixed for a term of years. Under Colonel Grey's system the demand made on account of the

clearances is not fixed, but depends solely upon the amount of work proposed to be done. There is a second difference of hardly less importance. Under the departmental system the demand for labor is made on the holding, or on subdivision of a holding; under Colonel Grey's, tasks are allotted to the village, and apparently even to groups of villages.

Fixed and fluctuating demand for clearances.

2. In regard to the first of these points of difference, the fixed system of assessment is intended on the one head to protect the cultivator from excessive demands on the part of either an unscrupulous or too progressive Superintendent, and on the other to protect Government from the dangers of the canals being neglected in the absence of any fixed standard for the annual demands. A fluctuating demand was formerly in force in Muzaffargarh, and led to great abuses. The demand was made usually in *chers*, but occasionally by *dak*. If made universally by *dak*, as is done by Colonel Grey, the chances of abuse would be undoubtedly less, but would still be considerable.

Objections to a fluctuating demand.

3. I cannot offer an opinion as to whether a reversion to the system of a variable demand, whether by *cher* or *dak*, would be possible under the terms of the settlements, but the point would require consideration before Colonel Grey's system could be adopted in its entirety. On other grounds, however, there appears to be a great danger of a system of variable demand breaking down especially when applied to canals on the right bank of the Indus or Sutlej, which are exposed to the continuous set of these rivers westwards. The work to be done in making a new head, diversion cut, or protective bunds for one particular canal may often be far in excess of the labor forthcoming from such canal, and I presume that, under Colonel Grey's system, the irrigators from one canal are not required to turn out for employment on another.

Zar-i-nágha expenditure on Mooltan Canals.

4. During the three years 1880-81 to 1882-83 the average expenditure from *zar-i-nágha* on the Mooltan Canals was Rs. 84,771. During the present season (1883-84) estimates amounting to nearly Rs. 1,40,000 have been sanctioned for new heads or diversions, the sanction for one head alone amounting to Rs. 60,000. In addition, further sums, say Rs. 15,000, will be expended in paying overtime *cher*, and in providing substitutes for those commuting under rule 21. The question is, how could liabilities like these be met under a system of variable demand and without a fine fund?

Zar-i-nágha income and expenditure must balance each other.

6. During the three years referred to above, the average income was only Rs. 69,771, so that the "monstrous abuse" of boarding up fines was in abeyance, and the expenditure was in excess of the receipts. During the present year the difference will be even greater, but of course in the long run, and after setting side a substantial reserve, the *zar-i-nágha* income and expenditure must balance each other. It may therefore be argued that the fines realized merely represent so much labor commuted, and that if there were no absentees (which is a result claimed for Colonel Grey's system) there would be so much extra labor to do the work now done at the expense of the fund. But the point is, that this extra labor can only be employed on the particular canals from which it is levied, and where it may not be required, whereas the *nágha* fines can be used in massing labor wherever it is most required.

The theory of the *zar-i-nágha*.

6. The theory of the *zar-i-nágha* is hardly fairly described by Colonel Grey. Starting from the fact that personal attendance is by force of custom and other consideration preferred by the people at large to the levy of a water-rate, there must, however, be individual cases in which personal attendance is irksome and the liberty to commute is freely acted upon. In poor villages the desire to commute is wanting, in the wealthy and flourishing ones it is very strong, and would hardly be affected by any alterations in the system of enforcing attendance. The percentage of absentees thus varies greatly on different canals, but is fairly constant from year to year on the same canal. The number of *chers* assessed for each canal is really the number necessary to carry out the normal or ordinary clearances, *plus* a known percentage for absentees who are not expected to be present but to contribute commutation money that will provide for extraordi-

nary or abnormal expenditure on that or any other canal. If all the *chers* assessed for a canal were to turn out, they would frequently be in excess of requirements, and as a matter of fact *chers* are not detained overtime, except when the work has been very heavy. All the *chers* so detained in Mooltan receive payment at 6 annas a day, a point which appears to have been overlooked in Colonel Grey's memos. Thus the *zar-i-nágha* may be regarded in the first place as a great convenience for those to whose circumstances the general condition of attendance in person or by substitute is ill adapted. And in the canal administration this fund is of the same importance as a storage reservoir in a scheme of water-works, or the accumulator in a system of hydraulic or electrical machinery. The employment of *cher* labor is subject to rigid restriction, both as to time and place, and it is well that a portion should commute and so furnish a delocalized fund that can be employed wherever and whenever it may be most wanted.

Comparison of the *zar-i-nágha* with the *bachh*.

7. In paragraph 3 of Colonel Grey's last memo. (without date) it is admitted that a canal fund is necessary, but it is urged that a canal *bachh* will answer the purpose better then the *zar-i-nágha* system. I am under the impression that the Ferozepore *bachh* varies from $2\frac{1}{2}$ to $4\frac{1}{2}$ annas per acre, and that it is mainly intended to cover expenses of establishment and other general charges of administration. Subject to correction, I venture to suppose that the Ferozepore fund would not suffice to meet an extraordinary outlay (say of Rs. 25,000) required on one particular canal, or that the fund could not be so applied without the strongest objections from the contributors from other canals. Such a fund can, I presume, only be employed for general and not special purposes, whereas under the *zar-i-nágha* system no canal has a lien on the fines realized from it. But I think there can be little doubt that a fine fund would be required on these canals under any system, and that the economic condition of those cultivators who have hitherto perferred to commute will not alter suddenly if *daks* be substituted for *chers*. A fine fund, therefore, there must always be, and it would certainly be an evil to have a *bachh* in addition, for there are "inherent abuses" also in the assessment of the *bachh*. Personally I consider the best system a universal *bachh*, or in other words water-rate, the canal administration finding its labor in the open market, and supplying it wherever it is wanted, as in the case of the Upper Sutlej and Dera Ghází Khan canals. But where the employment of statute labor is a condition, I would unhesitatingly prefer the *zar-i-nágha* to the *bachh*, for the reasons that have been given. Abuses are incidental to both systems, and require the greatest vigilance to check them, but I cannot admit they are inherent and uncontrollable.

The unit of *cher* assessment.

8. Colonel Grey's system in its entirety thus involves the substitution of a variable for a constant demand, and of a *bachh* for the *zar-i-nágha*. But there is a second difference of equal importance, the demand for labor at the clearances being made on the village, or even on groups of villages, whereas under the departmental system it is made on the individual owners or occupiers of holdings.

Dangers of unequal distribution within the mauza.

9. This is a point in Colonel Grey's system upon which the papers give very little information. We are assured that the work is done somehow, that the people settle it amongst themselvos, and that if some of the weaker members have an undue share of the work thrust on them they benefit in indirect ways from the increasing prosperity of the village, and that for the rest *de minimis non curat lex*. There may be something in this view in the case of lands that are very lightly assessed when considerable inequalities in the incidence of the burden of clearances may be tolerated without complaint. But in the Mooltan district, where the land is fully assessed, it is felt that the powers at present given to the headmen of the villages to regulate the *asámíwár* distribution of *cher* labor, though subject to checks that appear to be wanting in Ferozepore, are the most fruitful source of oppression and abuse, and I am quite willing to abide by the opinion of the Civil Officers as to the expediency of extending those powers in the manner involved in Colonel Grey's system.

Difficulty in enforcing penalties for default.

10. But if we accept the view that it is no part of the canal administrator's duty to trouble himself about the incidence of the demand within the village there is another condition without which it seems almost imposible to enlarge the unit of responsibility from

the holding to the village. It is necessary that there be no default. Colonel Grey assures us that this will be the case, that the work is all done somehow, and that no *zar-i-nágha* has ever been required in the Ferozepore district, nor apparently in Baháwalpur. But the papers do not tell us what means are employed to enforce from each village the discharge in full of its obligations. It cannot be pretended that task-work labor is so appreciated in itself that every man is eager to perform his share, and that the necessity for compulsion in some form or other cannot arise; so that the conclusion presents itself that the district administrator has means and influences at his disposal which are necessarily and properly denied to the officers of the Irrigation Department. The history of the canal and flood embankments in Muzaffargarh shows the extent to which these influences can be exercised. That the results have been highly beneficial I do not for one moment deny, but a time must arrive when such a system cannot be continued. As the lands become fully assessed the rights and responsibilities of individuals must be carefully protected and defined, until at last the only means of ensuring attendance is that which is alone at the disposal of the officers of the Irrigation Deparment, *viz.*, the simple power of fining defaulters, and this it would be difficult to enforce without opening a separate account for individuals.

Substitution of task-work for personal attendance.

11. For the above reasons, I am of opinion that, in so far as Colonel Grey's system involves a variable annual demand for labor for clearances, the shifting of responsibility from the owner to the village, and the abolition of the *zar-i-nágha*, it is utterly inapplicable to the canals that have been entrusted to the management of the Irrigation Department. But, with this reservation, I fully agree that the substitution, of the *dak* system for *cher* attendance, wherever and whenever practicable, would be a very important reform, the possibility of which I have been independently considering before I received the papers under consideration. I will not dwell on the manifest advantages of the system, to which full justice has been done by Colonel Grey, and it will perhaps be of greater service to point out the difficulties of the system, and the conditions under which it might be adapted to the conditions of departmental administration.

Primary assessment to be made in *chers* and converted into its equivalent in task-work.

12. In the first place, we must continue the present system of a fixed number of *cheras* to be annually levied from each canal, and distribute the number among the Mauzas and Asámís under whatever system may be in force. In other words a definite number of men must be called from each *Cherguzár*. While the assessment papers are being compiled, it will be the duty of the canal establisnment to make out the measurement papers in much the same way as described by Colonel Grey. It may be here noted that a great number of the canals in the Mooltan and Muzaffargarh districts have been staked thoughout during the present season, and that staking will be the completed on all the canals in a year or two. The next thing to be done is to determine the fair equivalent in cubic feet for a day's labor, a difficult point which will be referred to hereafter. When this has been done, a length will be assigned to each Cherguzár, containing approximately the number of cubic feet that may be demanded from the total number of *chers* for which he may be assessed.* The chainage of each length will be indicated on the assessment parcha, and by marks on the ground. The *chers* would then be left to their own devices until 15th March or other convenient date. If any of the work given out was then unfinished, it would be put up to auction before the *chers* were dismissed, and the defaulting *Cherguzár* would be entered for a fine equal to twice the amount of the lowest bid. Or when more convenient, the unfinished works would be measured up, converted into *chers* at the rate previously adopted, upon which the defaulter will be fined at the usual commutation rate, and the clearance completed by a gang of hired laborers.

Difficulties due to minute sub-divisions of the tasks.

13. There are two difficulties, however, to be apprehended. The first is in consequence of the small assessment actually made on some of the *Cherguzár*. I understand that in the Muzaffargarh district a *Cherguzár* is sometimes assessed for only three men, and even such small assessments are liable to further sub-division. It is the custom for each *Cherguzár* to send a certain proportion of his *chers* to distant head clearances, and to employ the remainder on the work nearer at hand, and the neighbours would resent the employment of all these men on the home clearances, while the *Cherguzár* would as strenuously object to despatching them all to the head. Where these fractioned assessments are numerous the system should not for the present be attempted, but in other cases means might be found for compounding them. Thus a task of a convenient minimum might be assigned to a group of small owners, and put up to auction at the commencement of the clearances, and the amount of the bid levied on the owners in commutation for their tasks. This is really the principle of the discredited Mooltan rule No. 21, but if the commutation were not enforced unless a bid were actually made, the present objections to that rule would lose their force.

* The length for such village would, of course, in the first place, be told off by the sub-overseer; and the sub-division among the *Cherguzárs* would be made subsequently.

Difficulties due to tasks being left incomplete.

14. The second difficulty is that which would arise if many of the tasks were unfinished. This can only be measured by experience, and, if the system be as popular as is asserted, may prove to be imaginary. The only way of mitigating it that I can suggest is to permit a slightly lower rate of commutation to owners who may express an intention to commute before the tasks are distributed. If, with the relief that might be thus afforded, the number of unfinished tasks were excessive, the door would be left open for great abuses, but it must be admitted that if the tasks are fairly given in the first instance it will be the irrigator's own fault if the work is not complete.

Allowances for soil, lead and lift.

15. There is another difficulty inherent in the *dak* system, which Colonel Grey has left almost unnoticed, *viz.*, that due to differences of lift and lead, and to the varying nature of the soil. It is here that there is the greatest room for favour or the reverse in the distribution of tasks that are hardly comparable, and it will be necessary for the Canal Officers to exercise as much vigilance in supervising the *cher* equivalents in task-work as is now required in visiting the *chers* and checking the attendance rolls. The system of earthwork adopted in Mooltan and Muzaffargarh somewhat simplifies the question, and the daily task can be expressed in terms of a constant, varying only with the nature of the soil, divided by the number of men in a line. Under task-work it may be expected that the men will range themselves to the best advantage, and if the Canal Officers regularly compare the number of men in a line with the number assumed by his subordinate in the distribution papers, he will be able to detect and check great irregularities.

Conditions for a fair trial of the *dák* system.

16. It may appear that the difficulties due to the sub-division of tasks and their being unfinished are so great as to condemn the *dak* system. They are certainly sufficient to prevent its being introduced universally and indiscriminately, but not, I think, to prevent a fair trial of the experiment. In view of the undoubted advantages that would attend the successful development of the system, I think it might be well to select two or three canals in each division, the conditions of which are most favorable to success. The work must be of uniform character and easily measured; the usual percentage of absentees must be low, and the number of petty holdings, involving minute fractioned assessments, as small as possible. I do not attach much importance to the fact noted in the papers that the *dak* system has hitherto been tried and found unsuccessful. My enquiries seemed to indicate that it has usually been resorted to when the *chers* called out were insufficient for the work to be done. The work was then divided among them, and they were left to finish it somehow. Under such circumstances the system would naturally be unpopular. Great caution will be required in fixing the task equivalent of a *cher*, so as to work the system fairly, not trying to get more out of the cultivator than under the present system. If all these points receive attention and the experiment be entrusted to an officer who is determined to make it succeed, I am of opinion that the chances of success are at any rate sufficiently considerable to warrant the attempt being made.

Concluding remarks.

17. In conclusion, I would say that the strong point of the *dak* system is that if the Canal Officer will take care that the distribution of the tasks is fairly and equally made in the first instance, the cultivators have it absolutely in their power to prevent the extortions of subordinates. They have merely to complete their tasks by the dates fixed. If they do this, all difficulties will vanish and the success of the system is assured. But in proportion as they fail to do this they will render themselves liable to all the exactions incidental to the old system. The fault of that system is that the most regular attendance will not enable the cultivator to shake off the time-keeper, who is a necessity in any system of daily attendance. It must, however, be remembered that the Canal Officer has no power to enforce attendance, and the *dak* system must break down if the cultivators do not spontaneously recognize the advantages of completing the tasks assigned to them, but, in order that they may have the chance, I recommend that a fair trial should be given.

Appendix to note on correspondence relating to the Cher system of clearance in Mooltan and Muzaffargarh, contrasted with the Dak system in Ferozepore and Baháwalpur.

Charges against the departmental management of canals.

In recommending the extension of the *dak* system, Colonel Grey has brought many charges against the departmental management of Inundation Canals, which I have necessarily left unnoticed in discussing the main question. Although desiring, as far as possible, to avoid useless controversy, I venture to place on record a reply to these charges, which may be summarised as follows :—

(i) That Inundation Canals are managed under the Ferozepore system at one-fourth the cost of those under the Public Works Department.

(ii) That under the Public Works Department no improvements are effected and no development made, and there is no return whatever for the exta cost of management.

(iii) That the *zar-i-nágha* fines are senselessly hoarded, and that the work due from absentees has to be performed by the *chers* who are present in addition to their own.

(iv) That 6 years are required to make an irrigation cut, and $2\frac{1}{2}$ years to put up a *jhalár*.

Cost of maintaining the Ferozepore canals.

2. I cannot contrast the cost of the maintenance of the Ferozepore canals with those under the Public Works Department for want of details of the former. I have, however, seen somewhere in print that the average rate of establishment is about 3 annas per acre, and that the value of the labor employed in maintenance varies from 5 to 10 annas per acre for different channels. If these rates are anything like correct, the assertion in regard to one-fourth of the cost must be regarded as hyperbolical.

Establishment and maintenance charges.

3. The following statement shows the cost of establishment and maintenance, including extensions and improvements, in all the Inundation Canal's divisions of the Public Works Department, during the last three years ending 1882-83 :—

Names of Canals.	Total area irrigated in three years.	Establishment.		Maintenance, &c., for three years.				
		Charges for three years.	Rate per acre.	Value of statute labor.	*Zar-i-nágha* fines realized.	From Imperial funds.	Total maintenance.	Rate per acre.
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Upper Sutlej ...	4,12,181	1,10,891	0·27	...	...	3,06,869	3,06,869	0·74
Mooltan ...	10,08,535	2,44,392	0·24	5,05,491	2,09,312	19,220	7,34,023	0·73
Muzaffargarh ...	7,47,889	1,22,780	0·16	3,04,562	65,448	12,116	3,82,126	0·51
Dera Ghází Khan ...	5,45,807	1,94,496	0·36	...	...	3,45,760	3,45,760	0·63
Total ...	27,14,412	6,72,559	0·25	8,10,053	2,74,760	6,83,965	17,68,778	0·65

From which it will be seen that the average rate is 4 annas per acre for establishment, and 10 and $\frac{1}{2}$ annas for maintenance, although in Muzaffargarh division with which perhaps the Ferozepore canals are most fairly comparable the rates are 2 and $\frac{1}{2}$ annas and 8 annas respectively.

Detail of establishment charges.

4. The establishment charges do not include provision for Leave and Pension allowances, for which one-seventh more may be added. They include, however, a due proportion of the pay of the Examiner of Public Works Accounts, of the Superintending Engineer, and of the Chief Engineer and their offices. It is presumed that the Ferozepore rate includes the pay of the Extra Assistant Commissioner who officiates as Superintendent of Canals. But to complete the comparison something should be added on account of the services of superior officers who have been connected with these canals. No body doubts that they have occupied much of the time and attention of Colonel Grey and other past Deputy Commissioners of Ferozepore and their Assistants, and they still owe much to his direction, though he is occupying a higher office.

Maintenance charges.

5. In regard to maintenance I think it will be admitted the canals on the right bank of the Sutlej and Indus, both of which are steadily working to the west, silt much more heavily than those on the left, and that the Ferozepore canals may be more fairly compared with those at Muzaffargarh, most of which are supplied from the side channels of the Indus. Of course these rivers will at times set on the east bank, but the general and progressive set is in the other direction. There are, however, other matters to be considered in making the comparison. In Muzaffargarh itself the rate includes value of the labor employed on the flood embankments for the protection of canal-irrigated land. The value of the labor given by the *chikar chers* (who are mainly employed on these works) and if the fines levied from the *chikar* absentees amounted to Rs. 55,689, and if this be deducted the maintenance rate would work out to only 0·44 of a rupee, or 7 annas per acre. The value of statute labor in this division is assumed at 4 annas per head, which is a fair rate for the district, and is that paid to substitutes. In comparing with Ferozepore rates it is necessary to know the value per head assigned for daily labor, and the values assumed for task-work. As those values are hardly put to the test in the open labor market, it will be very possible to under-estimate the real cost of the Ferozepore clearances. On the Mooltan canals overtime *chers* and substitutes are paid 6 annas a day, and the statute labor has been valued at this rate at which it is difficult, however, to hire labor. Some slight expenditure is also incurred in this division on protective bunds. In the Upper Sutlej and Dera Ghází Khan divisions labor is obtained in the open market, and is both scarce and dear. Lastly the expenditure in the Dera Ghází Khan division includes large sums spent upon protective embankments and river works, which are chargeable to the canals. In all divisions but the Muzaffargarh large payments have constantly to be made for land compensation. When due account is taken of all these circumstances it is believed that the rates given above will not compare unfavorably with those obtained upon the Ferozepore canals. It should be added that the rates are struck on the *zar-i-nágha* assessments, and not on the actual expenditure. As remarked in my note the *zar-i-nágha* income and expenditure must in the long run balance each other, and by taking the assessments rather than the expenditure for a given period we are able to form a fairer idea of the actual cost of irrigation to the cultivator, exclusive of revenue payable.

Improvement and development.

6. Passing to the second charge it must first be remarked that the extra cost of management under the Public Works Department is as shown above, either *nil* or inappreciable. In regard to improvements and developments it is impossible to discuss the subject at moderate length, as it is difficult to separate the increases of area irrigated due to outlay from Imperial Funds, from those due to wise management and supervision. The latest settlements of the Montgomery, Mooltan and Dera Ghází Khan districts have resulted in large enhancements of the revenue due to canal-irrigated lands, but of course it is always fairly open to question how much of this is directly due to the mangement to the Irrigation Department. But it must be understood that, although improvements have not been wanting, the Public Works Department has not the means at its disposal which are avail-

able for the District Officer. When Colonel Grey wishes to make a new canal he marks it out, estimates the work to be done, and then turns out all available labor from the village which he intends to benefit, and he is able to promise them exemption from any enhancement of revenue for several years. If such a power as this were given to the Canal Officers no doubt immediate progress might be made. On the Mooltan and Muzaffargarh canals the rules very properly provide that both statute labor and *zar-i-nágha* funds shall be expended only on the maintenance or improvement, and not on the extension of the canals. Any considerable extensions both on these canals and in those in the Montgomery and Dera Gházi Khan districts can only be effected by grants from Imperial Funds, which are obtained with difficulty, and only upon the assurance of an adequate return, which involves an immediate enhancement of the revenue on the lands newly irrigated, and the establishment of a capital account. I offer no opinion as to the comparative merits of these two systems, but merely point out why the department can so seldom make new inundation canals, and to explain that the only improvements in existing canals that are possible are those that can be effected within the limit of the annual maintenance grants, or of the statute labor and fine funds at its disposal.

Hoarding of the *zar-i-nágha*.

7. The third charge is made under a misapprehension to which partial reference has been made in my note. The *zar-i-nagha* expenditure is sometimes greater sometimes less than the income, but the system involves the one balancing the other in the long run, after allowing for a substantial reserve. The expenditure on the Mooltan canals has of late years been in excess of the income; in Muzaffargarh the income does not exceed Rs. 22,000, and the balance was only Rs. 20,000 when taken over. The reserve, therefore, required nursing and should not be less than Rs. 50,000. It stood at Rs. 52,285 on 1st April, 1883, and expenditure has since been more free, and may, when necessary, equal the income. The money is spent solely on the maintenance or improvement of the canals, though it is not necessarily "spent on the place where it was levied and when it was levied." If Mr. Palmer really means that it should be (in the passage quoted in the foot-note to Colonel Grey's No. 332, dated 26th December 1883), I emphatically dissent from his opinion, but I doubt whether on reconsideration he would maintain it himself. He apparently merely meant to protest against the *zar-i-nágha* being hoarded, and in this I quite agree with him.

Detention of the *chers*.

8. In the Muzaffargarh district it is very rarely that the *chers* are detained over-time, and never in consequence of absentees. Where more work is to be done than the *chers* can get through, an extra levy of paid *chers* in made, generally at the request of the irrigators, but these are called out at the same time as the regular *chers*, and they are all dismissed together. The number of unpaid *chers* fixed at settlement cannot be exceeded. In Mooltan *chers* are detained at the end of the 90 days if the work is not completed, but they receive payment at the rate of 6 annas a day. The only hardship is that this attendance is compulsory, and that while those who attend are fully paid, those who cannot do so are liable to the usual fine. Normally the *chers* are only detained when the clearances are exceptionally heavy. The extra attendance is then required of them, in the absence of any other labor, just as in Colonel Grey's system, heavier tasks may be given when the clearances are above the average, but there is this important difference that the extra work is *paid for* on the Mooltan canals. During the last three years some of the *chers* have been detained over-time (on payment) from another cause which it is hoped will be shortly removed, *viz.*, the impossibility of engaging a full complement of substitutes for the men who commute compulsorily under rule 21. This is a real hardship, but is all that will be found to justify the charge under reference. It is, however, only recent and casual, due to the unforeseen failure of an experimental rule, which will probably shortly be abrogated.

9. The fourth charge can hardly serious confutation. It appears to have proceeded originally from Mr. O'Brien, but is twice quoted in the correspondence by Colonel Grey. It is evidently a general charge based upon the experience of some particular case, expressed casually and not intended to be taken too literally. The delays referred to had, however, no connection with improvements, but were simply due to difficulties in obtaining the assent of land owners

to the passage of private water-courses through their lands, or to opposition made to further assignments of water. There is really nothing to cause delay for any works that can be shown to be necessary, within the limits of the funds available. During the present closure, sanction has been accorded to nine new heads, three divisions, two regulators, one bridge and several other minor works in this circle, and in no instance has any delay occurred. Of course it may be easy to point to special cases where it has been otherwise, but in such cases sufficient reasons for the delay will, as a rule, be forthcoming.

C.

Paper as to the Shah Nahr Canal in Hoshiarpur.

Canals.

7. There are a few small canals in the north of the district, taking their rise in the Beas. The most important in the *Shah Nahr* said to have been dug by Rai Murád of the house of Bhangála in the time, and under the auspices, of Adína Beg. Its head works are opposite the village of Changarwan, and it is taken thence along the bed of the Beas for seven miles, entering the main land at Sáriána. These first few miles require a good deal of care, and floods constantly destroy the dams made to keep the water in its proper course. The canal afterwards flows south-westward, watering some 6,000 acres in a part of the district where irrigation is most beneficial. It is at present considered a joint stock concern, the property of certain shareholders who contributed to its improvement in the commencement of British rule, and is managed by Chaudri Kharak Singh, one of the joint owners. After paying all expenses the profits are divided rateably among the shareholders according to their shares. An uniform rate of Rs. 1-8 per *ghumáo* is levied on all land irrigated. The canal has lately been extended to some poor villages in the south-west; but is capable of still further extension and improvement.

* * * * * * *

Improvements to the Shah Nahr.

170. The Shah Nahr, mentioned in para. 7, has been much improved during the settlement. Most of the credit is due to Nathu Rám, Superintendent of the Dasúya *tahsíl*, who had been for some time *tahsíldár* in the same tahsíl, and was well acquainted with the people of the tract. The Deputy Commissioner allowed me to make over the supervision of the canal to him, and he, in conjunction with the Manager, Chaudri Kharak Singh, extended it to a number of villages which had never received water before. A workable code of irrigation rules has been drawn up, and masonry heads have been constructed on the main distributaries to regulate the flow of water, and enable more water to get to the lower villages. The system of assessment has been described in para. 156. The existence of the third party between the irrigators and the Government in the so-called shareholders, is an evil which should be remedied. These shareholders should be bought out. I am confident that the result would be an increased area under irrigation, and what is more important a reduction in the cost of the water to the irrigator. At the present time the shareholders pay an occupier's rate of Rs. 1-8 a *ghumáo*, while the charge on other canals is only eight or twelve annas. Were the Government to buy out the shareholders, it could at once reduce the rate to probably 12 annas a *ghumáo*.*—(*Settlement Report of Montgomery, paras.* 7 *and* 170.)

D.

Papers relating to the Inundation Canals in Montgomery District.

* * * * * *

The canals.
The Khánwah.

11. According to popular tradition the Khánwah, the Upper and Lower Sohag, are all parts, of one and the same hill stream called the "Vein," or "Bein," a name which, according to the dictionary, implies an irregular stream with a clay bottom like a canal.

* The Government has just passed orders on this case (letter No. 30, dated 25th June 1885, from Junior Secretary to Government). The right of the so-called shareholders is to be considered to have lapsed, and the management will be under Government, which will charge an occupier's rate to cover expenses.

There are two streams of this name in the Jullundur Doáb. The one flowing through Kapurthala is said to have run in old days, before the Sutlej and Beas had changed their courses, between these rivers through the present Bári Doáb. The Sutlej shifting to the west, cut this stream in two. The portion in Jullundur continued as before, while the other portion, which had been cut off and was consequently called "Ghaía," became dependent for its water on the Sutlej. When the river was in flood, water came down this channel as far as Hujra, and then ran through the Gandobar nallah into the old Beas. When Mirza Khan, the Khan-i-Khanan, was Governor of Lahore (?) he improved this water-course, chiefly, according to Lieutenant Elphinstone (para. 79), by constructing an inlet or head on the Sutlej connecting the nallah with the river, about 20 miles above its former point of communication; and by erecting dams and embankments along the course of the canal. He is said too to have extended the canal so that water went down it as far as Nabha in Pákpattan; if it did, it was probably through the local nallah called the "Guri." The canal below Hujra was, after these extensions were made, called the "Khánwah." After the Khan-i-Khanan, nothing seems to have been done for a long time to improve the canal. It of course silted up; and it was only in heavy floods that any water came down. The flourishing "town of Dípalpur became depopulated, and the whole talúka of Hujra would have become as desolate as the region now traversed by the old Beas had it not been for an occasional supply obtained at high floods by the old channel which previously formed the inlet of the nallah." If the Moghals did nothing, the Afghans of Dípalpur, and the Sayads of Hujra, who succeeded them, were not more energetic. It was not till after Ranjít Singh had occupied the country that any effort was made to restore the canal. In A.D. 1807, Díwán Radha Ram, the Kardar, repaired the head and cleared out the channel. The canal after that flowed steadily during the rainy season till 1823. The next year it silted up. Jowind Singh, Mokal, then held taluka Dípalpur in jagír, but did nothing. Bába Bishan Singh was at Hujra; he did nothing. But in 1841, Fakír Chiragh-ud-dín, under orders of Maharájáh Sher Singh, had the canal cleared out and a new head dug at Mámúki, still known as Sher Singh's inlet, but long since abandoned; (para. 3 of a memo. by Superintending Engineer, Upper Sutlej Inundation Canal, dated 9th December 1870). Shortly after annexation the canal was made over to the Canal Department, and has since been greatly improved. It was lengthened, and now tails into the Para nallah, at Mahmúd-pur on the Pákpattan and Gugera road. In 1853, three "rajwahs," or large distributing channels were made. (1) The northern rajwah from the bridge at Hujra to the bridge at Nanthu Shah, 16 miles long. (2) The southern rajwah, from the bridge at Hujra to the bridge at Dípalpur, 11 miles long. (3) The Bhawal Das rajwah, from the bridge at Dípalpur to the village of Bhawal Das, 5 miles long. The banks of the canal are covered with trees of various kinds; while "sarr," (*saccharum moonja*) grows abundantly along the "rajwahs."

The extreme length of the canal from its head at Mámúki, in the Lahore district, to the tail at the Para nallah is 84 miles. At the head, the Khánwah is 60 feet broad, and 6 feet deep. The discharge ranges from 400 to 1,400 cubic feet per second.* The system of irrigation on this canal, and the various modes adopted for assessing and collecting the water dues of it, will be noticed in part I, chapter 4, and part II of this report.

12. The two Sohags formed one stream, and were part of the Beín.

The canals.
The Uppar or New Sohag.

The Sutlej first cut this river near Lallu Gudarke, a little to the south of Atári. Then again at Pánjgirián, a cluster of villages to the south of Mámúki. In fact the story is, that the Bein ran in the shape of a printed S, and the Sutlej cut it first at the bend to the right, and then at the top over the bend. And there is no doubt that the upper Sohag nallah, after, leaving the river, runs in a curve and rejoins it. Still it is hard to see how the Khánwah and the two Sohags could be part of the same stream. It may be that the Khánwah represents the Kapurthala Bein; while the upper and lower Sohags are continuations of the eastern Bein. It seems highly probable that the Sukhnye, which runs through Mamdot and debouches into the Sutlej opposite Lálú Gudarke, is the connecting link between the Sohag and the

* Taken from papers connected with scheme for building a dam across the Sutlej at Masteki.

Bein. It is quite evident that when the Sutlej changed its course to the north and joined Beas above Ferozerpore, it must have cut both the Beins in the upper and lower portions of their course. The upper Sohag does not seem to have been used as an irrigation channel till A.D. 1827, when Sardar Jowind Singh, Mokal, the jagírdár of Kanganpurah, in Chunián, dammed up the Dhan nallah at Jang Abdalla Shah, by which the water of the Sohag used to escape, and brought this water through the Bhus nallah, which joins the Sohag near Ghara Singh, into his lands. About 1840 the mouth of the new Sohag closed up. In 1854 the Canal Department took charge of it and erected a dam near Jang Abdulla Shah, and cleared out the Dhan nallah, and extended it so as to carry the water of the Sohag into the Khánwah near Bunga Gursa Singh. Next year the dam was pulled down and the channel cleared out to Kaler Kalan and continued thence to Tahir, a little to the west of Basírpur, on the Dípalpur and Fázilka road. In 1864 a further extension was made, and the canal carried down a new cut to Búnga Haiat, in the Pákpattan tahsíl, and thence alongside the Dípalpur and Pákpattan road to the Para nallah, into which the surplus water escapes. On account of so much of the canal being new, it is known as the new Sohag (Sohag jadid). The length of the canal is 65 miles, *viz.*, 37 to Tahir, and 28 from there to Para. It is 40 feet broad at the head; and it estimated to carry 880 cubic feet per second for three months, and 240 for three months more. Though smaller and less important than the Khánwah, it was worked more satisfactorily lately, as the latter canal has failed now for four years, running to a greater or less extent. In 1865 two rajwahs were dug; one from Gama Wagra to Banga Salihon, 5 miles long; and the second from Bhawaldas to Bapparwal, 7 miles in length. The head of the canal is at Khúga, four miles south of Mámúki.—(*Financial Commissioner's Review of Montgomery Settlement Report.*)

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34. Before assessing the two Sutlej tahsíls, Dípalpur and Pákpattan, in respect of the land revenue, it was necessary to decide the rates which were to be paid by the people for canal water, and the principles on which these rates were to be fixed and collected. In the Sikh time the Khanwah and lower Sohag supplied certain villages in this district with water. It was not till 1843 that any water rate was levied. The rate then imposed was one anna per kanal on crops that came to maturity, and applied only to the Khanwah. Under English rule this rate was continued. At first a farm used to be given of this tax, and yielded on an average Rs. 9,000 to Rs. 10,000 annually. The charge was extended to the Lower Sohag. In 1855, Mr. Vans Agnew, the Settlement officer, proposed assessing canal irrigated and sailába lands in a new way. He thus describes his method.—

Assessment of canal lands.
Early management.

"I have fixed two jamas for every village, one upon all kurwah or well-lands, which can be cultivated without the aid of inundation from the rivers or canal, to be *permanent*, and to be considered the fixed demand until the expiry of the period of settlement; and the other upon all Sailába to be *variable*, and under the name of ábiána in canal lands and of river sailába jama in those subject to the influence of the Sutlej to fluctuate with the uncertain inundation and to be annually revised."

Mr. Vans Agnew's scheme.

The available rates proposed were per acre, Rs. 1-11-0 in Dipalpur, Re. 1-8-0 in Hujra, and Re. 0-12-0 in Basírpur chaks. Along the river they ranged from Re. 1-10-0 to annas 6 per acre. This scheme was suggested on account of the uncertainty of the river inundations and canal water supply. At regards the canals, Mr. Vans Agnew wrote:—

"The irrigation they afford is uncertain and constantly varying. Firstly, in the aggregate annual volume of water they carry; secondly, in the quantity of water they supply to each village; thirdly, in the time when they yield that supply; fourthly, in consequence of their being in a transition state, fresh arrangements of the canal officers continually altering the directing of the water supply."

His proposals were rejected. The Financial Commissioner, in his letter No. 962, dated 26th March 1856, laid down the principle to be adopted, which, according to Lieutenant Elphinstone, was this:—

"In the river sailab lands a moderate assessment which the proprietors could be able to pay in ordinary years; in the canal villages, a division of the demand between land rent and ábiána in such proportion as to represent with proximate correctness their relative values, the assessment at the same time being fixed at so moderate an amount that no reduction of ábiána should become necessary in ordinary years."

Another scheme adopted.

On this principle Lieutenant Elphinstone assessed :—

"In the canal villages the demand has been divided between land and water rent; and the relative value of these has usually been assumed in accordance with the agreement arrived at on this point by Major Brown and myself in May 1856, as bearing to each other the proportion of 2 to 3."

The arguments brought forward against Mr. Vans Agnew's scheme were the difficulty of ascertaining the yearly sailába area and the worry of annual measurements. The permanent water rent or fixed ábiána amounted to Rs. 25,110. The canals broke down almost immediately, and Rs. 20 per cent. had to be taken from the land tax and added to ábiána. This raised the fixed ábiána to Rs. 37,083. In villages where the water charge was not fixed, lands irrigated from the canals paid the old rate of one anna per kanal.

Plan adopted at present settlement.

35. This system did not work satisfactorily. The people had no object in economizing water, and they wasted it. It was found that many villages were paying next to nothing for their water. The canal tracts were not bearing any thing like a fair share of the public burdens. And the revenue credited to the canals was far from equalling the expenditure incurred in keeping them up. It was also known that the prosperity of the canal tracts depended entirely on the canals; and that if the canals were abandoned the country would relapse into jungle. It was, therefore, only fair that the canal rates should be raised. A good deal of correspondence took place on the subject; and the result was the adoption of the main principle of Mr. Vans Agnew's scheme. Each village was to be assessed at a sum which would represent what it could fairly pay from its natural products, báráni and well cultivation. This was to be fixed land revenue. Besides this fixed jama, villages taking canal water were to pay for it separately. The area irrigated was to be ascertained by annual measurements, and the rates of charge were to vary with the crops grown. If the crops did not come to maturity owing to the failure of the canal, no ábiána was to be paid. In case of partial failure of crops, partial remissions might be made. Lands irrigated by lift were to pay half the rates fixed for lands irrigated by flow. The amount payable each year was to be announced to the lambardárs by the Canal officer. His Excellency the Governor-General in Council sanctioned the proposed arrangement, with some modifications, for five years (No. 803, dated 29th September 1873, from Secretary to the Government of India to the Secretary to the Government of the Punjab). No portion of the fluctuation revenue was to be credited as proposed to the Canal Department; but there were to be :—

"Three sub-heads, under the general head of land revenue. Under the first of these sub-heads will be shown the fixed báráni assessment, or the rate which would be leviable on unirrigated land; under the second the fixed assessment on lands irrigated by wells, while under the third sub-head will be shown the fluctuating revenue derived from lands irrigated by canals. This last will be the amount which the irrigation department will be entitled to show in their administration departmental accounts as the financial result of the lands under their charge."

Jágírdárs.

Jágírdárs were to receive the whole revenue of their villages credited under the first two sub-heads, and one-half of that shown under the third sub-head, the other half representing approximately what would elsewhere be separately charged as water-rate.

Extra cesses

As regards cesses, it was decided that the people in this tract should only pay at half the ordinary rates for the

(1) Patwárí's cess.
(2) Lambardár's cess.
(3) Ala Lambardár's cess.
(4) Zaildár's cess.

and that Government should contribute out of land revenue an amount equal to that paid by the people. I presume this contribution is to be made only as regards the fluctuation revenue. Formerly only the patwárí's cess was realized on the ábiána jama, fixed or fluctuating. Lately the local cess also was charged on the fixed ábiána.

This rule was to apply to jágír villages also. The other authorized cesses were to be paid on and over and above the entire Government demand by the occupants of land.

Watr-rates.

The rates per acre, for the different crops, which were ultimately sanctioned are the following :—

Class.	Crop.	Rs.	A.	P.	Class.	Crop.	Rs.	A.	P.
(a) Kharif. I	Sugar-cane	1	12	0	(b) Rabi.	Gram	1	4	0
II	Rice and gardens... ...	3	0	0		Masar	1	4	0
III	Cotton	2	0	0		Churál	1	0	0
	Hemp	1	12	0		Methra	1	0	0
	Red pepper	3	0	0		Tobacco	0	12	0
	Til...	1	12	0		Wheat	0	12	0
	Melons	2	0	0		Barley	0	12	0
	Indigo	1	4	0		Gojí	0	12	0
	Turmeric	1	4	0		Borura	0	12	0
	Waternuts...	1	4	0		Sarhon	0	12	0
IV	Jowár	1	8	0		Dhania	0	12	0
	Bájrá	1	8	0		Tárá Míra	0	12	0
	Makkí	1	8	0		Zira	0	12	0
	Kangni	1	6	0		Poppy	0	12	0
	Chína	1	6	0		Vegetables	0	12	0
	Mung	1	6	0		Other Rabi crops ...	0	12	0
	Moth	1	4	0		Kharíf fallow land ...	1	12	0
	Other Kharíf crops ...	1	2	0		Rabi fallow land ...	1	0	0
						Forest plantations ...	1	0	0
						Grass	0	12	0

Most of the rabi crops can get only one watering, which is not sufficient to bring them to maturity. They pay therefore at a uniform rate. Some crops can be brought to maturity with one watering. They pay an enhanced rate on that account. On the same principle, the light rate on sugar-cane is explained. I do not think these rates high—indeed they do not fairly represent the value of the water. Still they are much higher than what the people have hitherto paid; and at first a considerable increase of pressure will be felt. In a country like Montgomery, it is far from advisable to press heavily on the agriculturist. These rates give an initial increase of revenue of *no small* amount. They can be raised hereafter if thought advisable. At present it is very hard to say how they will affect the proprietor and tenant. Hitherto the latter has, except in a few cases, paid the ábiána, at the rate of one anna per kanal on the ripened crop. The proprietors paid the Government water tax, either that fixed at settlement, or the fluctuating cess of 8 annas an acre, and divided any surplus that remained, or made up any deficiency that accrued over and above the amount collected from the tenants or other occupiers of the land. Will the tenants now pay the increased rates? This is a question that at present cannot be answered well. I think they will. In this case, the rates might be still further raised so as to come at the proprietor's share of the produce; or the principle of an owner's and occupier's rate might be introduced. It was, however, generally admitted that at present the country is not ripe for the introduction of the latter measure, which would lead to unadvisable interference in the relations of the landlords and tenants. This question of double rates has somewhat complicated the decision of the really essential point, which is, given so many acres of canal-irrigated land, what is a fair amount for them to pay to Government? When speaking of "water-rates" here, I have not used the term in its more narrow technical sense, but simply to express the sum taken by Government in return for a supply of water. It should, however, be a subject of careful enquiry, which class pays the increased rates; and in what proportion, if both contribute to them.—(*Montgomery Settlement Report by Purser, pp.* 6-8 *and* 178-181).

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The new system of assessment of canal-irrigated lands adopted in this settlement: how it was worked up to date.

11. The plan adopted at present settlement for the assessment of lands irrigated from the Khánwah and Sohag canals in tahsíls Dípalpur and Pákpattan is described in paragraph 35 of chapter II, part II.

The canal rates by which the fluctuating revenue is assessed are of the nature of combined owner's and occupier's rates; in jágír

villages half this revenue goes to the jagírdár, the other half representing approximately what would elsewhere be separately charged as occupier's rate. Mr. Purser in his Dípalpur assessment report estimated the future annual average area of irrigation from these canals in tahsíl Dípalpur at 60,000 acres *per annum*, and the revenue from the canal rates at Rs. 1,02,312. If he had taken into account the lands irrigated by these canals in tahsíl Pákpattan, his estimate would have been about 65,000 acres and Rs. 1,09,812.

From the annual report of the Irrigation Department for the three years the new assessment has been in force, I gather that the area measured up as irrigated and the fluctuating revenue assessed and realized by the canal rates has been as follows:—

	1873-74	1874-75	1375-76
Area irrigated	Acres 61,353	Acres 74,065	Acres 1,14,755
Fluctuating revenue assessed	Rs. 73,178	Rs. 99,734	...
Fluctuating revenue realized	" 63,473	" 88,368	Rs. 61,593

The small area irrigated in 1873-74 appears to have been due partly to the fact that there was unusally little water in the canals, and partly to fear of the new rates, which induced many zamíndárs to decline to take water. The large area returned as irrigated in 1875-76 appears due to the heavy floods of that year; more than three-fifths of it was rabi irrigation.

The difference between revenue assessed and realized in the first two years seems to have been mostly due to remissions on account of excess measurements or crops not brought to maturity; it was also due in small part to the fact that nine or ten villages are at present protected from the new rates, the term of their original settlements not having yet expired. The revenue of 1875-76 looks very small when compared with the irrigated area. The fact appears to be that they are not properly comparable—the area is that of the agricultural year, and the revenue that of the financial year. The kharíf area of 1875-76 was not large, and many remissions had to be given on account of crops destroyed by the flood; the area of the following rabí was very large, but the the revenue due on it will belong to the year 1876-77.

The result so far would seem to show that Mr. Purser's estimate of the average annual area of irrigation was a little too low, and that his estimate of the average incidence of the fluctuating revenue was too high. The fact that the new canal rates are differential seems, as we anticipated, to have tended to diminish the cultivation of the higher rated kharíf crops; but except as regard rice this tendency is probably only temporary. According to native report rice is now only cultivated in low-lying lands which are not fit to grow anything else. As the quality of the rice is not good, the rate it bears is no doubt comparatively high. I have no doubt that the class of crops cultivated will gradually improve, and that the proportion of kharíf to rabi irrigation will in future be greater than it has been in these three first years; if so, the fluctuating revenue may rise to the amount of Mr. Purser's estimate. When this point is reached the canal villages will be paying between fifty and sixty per cent. more revenue than they paid before Mr. Purser's settlement—a fact which should weigh heavily against an increase of rates if the Canal Officer propose to raise them when the term of five years, for which they were sanctioned expires. I lately got from the Tahsildár of Dípalpur a list of the canal villages in his tahsíl showing the paid revenue and ábiána paid in 1870-71, and the fixed and fluctuating revenue paid in 1874-75; the result was an increase of 40 per cent. though the fluctuating revenne of these villages for 1874-75 amounted to Rs. 80,934 only.

The new canal rates are not, as Mr. Purser expected, borne entirely by the tenant; the tenant almost always pays them just as he paid the old ábiána rate of 8 annas, but the proprietor has had to considerably reduce the tenant's rent in consequence. What has happened is as follows:—Formerly the tenant paid to the proprietor one-third produce if the latter cleared the char or water course (as he usually did), and one-fourth only if he, the tenant, effected the clearance. Now, where the proprietor clears the water-course the tenant pays him one-fourth instead one-third as before; the proprietors have in fact been compelled to lower the rate of their rents by a fourth. I hear also that in spite

of such reduction the tenants complain of having to pay the canal rates, and that a certain number of them have lately deserted the canal villages in consequence.

The new assessment of the canal villages appears to me to be working well on the whole. I hear that the zamíndárs still grumble and profess to prefer the former system of assessment, but that was to be expected, seeing that the fluctuating system happens to be associated in their minds with an increased demand. The Canal Officers appear to have succeeded in getting satisfactory returns from the patwárís, and in overcoming other preliminary difficulties.—(*Settlement Commissioner's Review of Montgomery Settlement Report*).

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Fluctuating system of assessments in Dípalpur and Pákpattan.

5. In paragraph 11 of his review Mr. Lyall shows that the irrigated area in these tahsíls during the years 1874—1876 has been somewhat in excess of Mr. Purser's estimate, while his estimate of the average incidence of the fluctuating revenue was too high. The differential rates appear to have tended to diminish the cultivation of the higher rated kharíf crops; but Mr. Lyall thinks the decrease only temporary, except in regard to rice cultivation, and that the class of crops cultivated will gradually improve. The canal villages are now paying between 50 and 60 per cent. more revenue than they paid before the revised settlement, and this fact should weigh, Mr. Lyall thinks, against increasing the rates when the term of five years, for which they have been temporarily sanctioned, shall have expired. The Financial Commissioner agrees with Mr Lyall in thinking that the fluctuating rates include both owner's and occupier's rates—a fact which may be inferred from the jagírdárs being allowed to take half the fluctuating rate in jagír villages, and that the alternative suggested by Mr. Purser in part II., chapter II., paragraph 35, of his report for levying an owner's rate over and above the fluctuating assessment cannot be adopted, though the consolidated rates may be revised.

Working of the system.

6. The Financial Commissioner concurs in Mr. Lyall's opinion that the new system is on the whole working well. The reports on the annual measurements by the patwárís show that the difficulties connected with this part of the system are being gradually overcome. Whether the fluctuating rate is paid by the tenant, as anticipated by Mr. Purser (in the paragraph above quoted), or whether as Mr. Lyall thinks (paragraph 11) the proprietor has had to lower his rents and thus virtually bear a portion of the charge, there can be no doubt that the new system is fairer than the old, and better suited to the circumstances of the tract. In view of the remarks contained in the preceding paragraph, Mr. Egerton is of opinion that great caution will be required before raising the present crop rates. It must be remembered that the cost of clearing the long water-courses is unusually heavy here, and that the profits of agriculture are much diminished from this cause. If at any future time rájbahas are made which will diminish the length of the zamíndárs' water-courses the rates may be fairly revised.—(*Settlement Commissioner's Review of Montgomery Settlement Report*).

E.

Papers as to the Inundation Canals in the Mooltan District.

Canals.

62. A very good and full report on the canals was furnished by Mr. Morris at the last settlement. It will be noticed more at length when the *cher* system is discussed in the chapter relating to administrative matters. These canals are cuts from the river, varying in length from 3 or 4 to 50 miles, and in width, from 6 to 30 feet, running inland as far as the slope of the country will allow. As this slope is from north-east to south south-west, the course of the canals is nearly the same as that of the rivers, and they irrigate almost entirely on the south side, that is, the Chenab canals on their right hand and the Sutlej canals on their left hand bank. The first of the Chenab canals leaves the river about 20 miles to the north-east of Mooltan; the last leaves it about 50 miles to the south-west, on the borders of the Shujahabad and Lodhran tahsíls. Within this distance of 70 miles there are 14 canals, so that on an average there

are only 5 miles between each canal, and as far as the canals reach, the country is completely protected. The total length of the Chenab canals was then 219 miles, giving an average of a little more than 15 miles a canal; but their length is by no means equal; 6 of the 14 were under 10 miles; 3 were from 10 to 15 miles; 3 were from 20 to 25: and 2 were from 35 to 40 miles long. The first of the Sutlej canals, the Diwánwah, leaves the river just below Ludan, the last, the Hafizwah, leaves it at a point below the town of Bahádárpur. The intervening distance is about 90 miles, and as there are 20 canals the average distance between each would be much the same as on the Chenab. The total length of the canals was 440 miles, or an average of 22 miles each, but as on the Chenab, the length varies considerably, 5 of them are under 10 miles, 4 are from 10 to 20 miles, 6 are from 20 to 30 miles, 3 are from 30 to 40 miles, and 2 are over 50 miles long. The total length of all the canals, counting the main channels only, is thus 659 miles. Since the Settlement one of the Chenab canals, the Biluchánwála, has been abandoned, but the Daurána Langána has been considerably lengthened. On the Sutlej the Kángra has been abandoned, but the Chatterwah, formerly a branch of the Jamwah Khurd has been made into a separate canal; so that the total length of the canals is certainly not less than before. Only two of them, *viz.*, the Wali Mahomed and the Sikandarabad, which flow past the city of Mooltan, are used for navigation, and even on them this consists merely in the floating of logs of timber down to the city or of conveying to it the cargos of larger vessels which have been unladen at the river bank. All the canals are merely inundation, that is channels for conveying off the surplus water of the rivers between April and September, but very occasionally, as was the case on the Chenab in 1877-78 and on the Sutlej in 1876-77, there is a small supply of water in one or two of the canals throughout the cold weather. The canals are also shewn in map III.

* * * * * * *

The *cher* system.

238. In paragraph 62 I referred to Mr. Morris's report on the canals at the last Settlement, and gave a brief description of them saying that I would notice them more at length when I came to discuss the *cher* system. This system is fully described by Mr. Morris; it is simply that persons irrigating from the canal instead of paying a water rate proper in cash, pay it in kind by themselves doing the annual clearances of the silt which collects in the canals during the months they are at work.* The labour this supplied was in no sense forced, the liability for it was a perfectly just contract, deliberately entered into by every man who applied for water, and the penalty for default was not that the defaulter should be seized or imprisoned, but merely that he should pay a fine of 8 annas a day, nearly the whole of which would be expended in hiring another labourer to supply his place.

* A labourer thus working is called a *cher*.

The question of its abolition now raised at present settlement.

239. Under any circumstences the system must have come under review during the present settlement, but the prominent notice which has been given to it is due in a great measure to the tour of the late Lieutenant-Governor, Sir Henry Davies, through the sourthern part of the district in the beginning of January 1874. At that time there seems to have been rather an outcry against "forced labour" generally. The *cher* system was erroneously supposed to be an illustration of it, and there were one or two points in its actual working, such as allowing the fines for absentees to accumulate into heavy arrears and then levying them all at once, which did give rise to some complaints. A memo. was accordingly drawn up by the Secretary to Government, and forwarded to the Financial Commissioner under cover of his No. 215, dated 30th January 1874, in which the chief objections that had been made against the system, and its most prominent advantages were briefly set forth, and an opinion was asked for as to whether it might not be expedient to abolish the *chers* altogether, and clear the canals by paid labour.

Nature of question.

240. This memo. was sent to me for report. My opinions and those of the Settlement Commissioner are contained in the correspondence noted below:—

1. Sett. Officer, Mooltan to Sett. Commr. No. 34, dated 5th June 1874.
2. Sett. Commr. to Sett. Officer, No. 298, dated 8th July 1874.
3. Sett. Officer to Sett. Commr., No. 53, dated 17th July 1874.

4. Sett. Commr. to Secy., Financial Commr., No. 143, dated 18th August 1874.
5. Sett. Officer to Sett. Commr. No. 62, dated 24th August 1876.
6. Sett. Commr. to Sett. Officer, No. 287, dated 6th September 1876.
7. Do. do. No. 298, dated 11th September 1876.
8. Sett. Officer to Sett. Commr. No. 74, dated 2nd October 1876.
9. Sett. Commr to Sett. Officer, No. 321, dated 11th October 1876.
10. Sett. Officer to Sett. Commr. No. 80, dated 14th October 1876.
11. Sett. Commr. to Secy. Financial Commr., No. 77 C., dated 1st March 1877.
12. Do. do. No. 130, dated 30th May 1877.

The questions for consideration were—

I.—Were the evils of the *cher* system so great as to render its abolition necessary at any cost?

II.—If its abolition was not absolutely necessary, was it still generally advisable?

The first question was soon answered in the negative; the only thing which would make the abolition absolutely necessary would be the fact that the system was one of forced labour pressing heavily on the people, and this it most clearly was not.

Arguments for and against the *cher* system.

241. On the question as to whether the abolition, although not absolutely necessary, might not still be very advisable, the *pros.* and *cons.* are set forth in Mr. Thornton's memo. In favor of the system it was alleged that it was old and popular, and that it was the least burdensome and most efficient mode of clearing the canals, for either labourers could not be obtained in any other way, or if they could, their cost would be enormous; against it, the charge was made that it was cumbersome and inefficient, and that, though it might be popular with the rich, it was full of grievances which were severely felt by the poorer proprietors. It was also argued that the experience of all other districts showed that there would be but little difficulty in getting labour.

Estimated cost of the abolition.

242. When the arguments were thus pretty equally balanced, a most important point for consideration was what would be the cost of the proposed change? what would be required for—

(i)—The actual cost of clearances?

(ii)—The extra establishment necessary to work the new system? and could this be raised without loss to Government?

As regards the cost of clearances, no data existed to shew the amount of silt to be removed annually; the estimate had therefore to be made on the numbers of *chers* called out, and the number of day's labour given by them. In my report, in 1874, I calculated in this way that some 6,000 men were employed for 3 months, and that the cost would be from Rs. 2,50,000 to Rs. 2,75,000. In my report in 1876 I examined more at length the Canal Officer's returns of *chers* employed each year, and came to the conclusion that the number of day's labour required would not be less than 690,000. If the equivalent of a *cher's* labour were 8 annas a day as estimated by me, or if, as estimated by Mr. O'Brien, the Canal Officer, a *cher* removed 200 cubic feet silt a day, and if the contract price for clearing were Rs. 2-8-0 per 1,000 cubic feet, the cost of this would be Rs. 3,00,000 a year. In addition to this I considered that Rs. 25,000 a year would be required on account of extra establishment. Colonel Gulliver had estimated the cost of clearances at Rs. 2,27,000, taking 8 annas as a day's wages. Mr. Lyall, in reviewing my report as Settlement Commissioner, considered that whilst 600,000 might be accepted as the number of day's labour required, men would eventually be obtained easily as 0-6-6 a day, or Rs. 12 a month, and that the cost of clearances would thus be reduced to about Rs, 2,50,000. He also considered that some Rs. 20,000 more would be required for the increased establishment. Thus the cost of the change would certainly not be less than Rs. 2,70,000 a year and to save Government from the loss the existing jamas of the canal villages would have to be raised to this amount. To see whether this could be done a schedule of acreage rates drawn out by the Canal Officer and myself, and revised by Mr. Lyall, was applied as a rough test to the areas under the different crops as shewn in the canal returns of previous years. These rates were

the maximum that could be charged, and they would have had the effect of raising the jama 99 per cent. on the Sutlej and 49 per cent. on the Chenab canal villages. Even if the new system led to no falling-off in the area irrigated, the income under it would only just suffice to cover the extra cost, whilst if a falling-off occurred, or if the cost proved to be under-estimated, the Government might suffer a heavy loss, and under any circumstances it would have to forego the increase which might be expected under the old system.

General expediency of abolition.

243. The fact that the proposed change would certainly result in some loss, either direct or indirect, to Government was an argument of considerable weight against it, but hardly a decisive one had the change been clearly desirable on other grounds. Was it so desirable?

Partially recommended by Sett. Officer in 1874.

In my report in 1874 I was inclined to think that it was, and I recommended that it should be introduced experimentally on certain lands. I did not even then recommend it for immediate adoption throughout the district, for although there appeared fair reason to believe that free labour could be obtained without any great difficulty, yet the question was not free from doubt, and any failure on this point would have been disastrous. But the change seemed to me expdient in itself because—

Reasons for the recommendation.

I. The present system is certainly cumbersome; the Canal Officer himself complained of it, and no doubt he could get his work done more easily and efficiently if he had full power to make his own arrangements for it.

II. It did fall heavily on the poorer men and gave rise to complaints. Its comparative popularity amongst the better-off appeared to me mainly due to their extreme dislike of the assessments by annual measurements which would have necessarily followed it. But I did not at first see how the new Settlement of the canal jamas could be fairly framed except on the basis of these measurements. If they had to be introduced under any circumstances the chief objection to the change would fall to the ground.

Opinion modified in 1876.

244. In 1876 my opinion in favor of the change was not so strong as before, but I still considered it desirable, and recommended that it should be made experimentally on the seven canals nearest Mooltan. Mr. Lyall was at first inclined to support this, but further enquiries amongst the people shewed that the feeling in favor of the present system was much stronger and more general than we had supposed, and that it was better grounded, for the change would certainly have caused a great revolution in the rent rates, and the general relations between proprietor and tenant. Its admitted evils seemed to be more capable of remedy, and Mr. Lyall was also able to devise a mode of assessment which retained the present system of fixed jamas for canal villages, and rendered the introduction of canal measurements unnecessary. Accordingly in his last letter* written as Settlement Commissioner, on this subject, he expressed his opinion that as the proposed change would certainly involve a loss to Government, as it was not really necessary, and as there was a strong feeling against it, it should not be made, unless it were asked for by the majority of the proprietors taking water for any one canal. In this case, which was extremely unlikely to occur, Mr. Lyall would have allowed the change to be made; an estimate of the actual cost of clearances *in that canal only* would be made by the Canal Officer, and a rate to cover this, adapted to the particular circumstances of that canal, could be devised without difficulty. In these opinions I entirely concurred, though I was still anxious to see the abolition of *chers* tried as an experiment on a single canal, the Dauráná Langáná, and Mr. Lyall was inclined to agree to this.

*No. 130, dated 30th May 1877.

Final report in 1877 in favor of the present system.

Opinion of the Financial Commissioner.

245. In forwarding the correspondence as Financial Commissioner for the orders of Government, Mr. Lyall, in his Secretary's No. 394 S., dated 3rd April 1879, repeated the above opinion given by him as Settlement Commissioner in 1877, with the exception that he was unwilling to try the experiment of abolition even on the Dauráná Langáná, unless the majority of the proprietors irrigating from the canal were in favor of it. He also proposed that the two following clauses should be inserted in the administration-papers of the canal villages as a condition of the new Settlement; Government reserves to itself the right—

(i.) To abolish the *cher* system at any time it sees fit on any canal, and to substitute an equivalent rate to cover the cost of doing the work itself;

(ii.) To cancel the Settlement of any canal irrigated village where reductions of assessment are claimed, or frequent remissions have to be made, and to substitute fluctuating assessments based upon annual measurements of cultivation.

Orders of Government.

The present system to be maintained.

246. In the Secretary to Government Punjab's No. 680, dated 28th May 1879, His Honor the Lieutenant-Governor expressed entire concurrence in Mr. Lyall's views, and sanctioned the clauses proposed by him. His Honor considered that the *cher* system was in no way objectionable in principle, that it was adapted to the peculiar circumstances of the Mooltan district, and that its abolition would, besides causing a serious loss to Government, be attended with inconveniences of many kinds to the people. The evils complained of under it would almost all be remedied under the revised rules, which were about to be forwarded to Government for sanction. He therefore decided that the system should be maintained. In the Secretary to Government, Home Department's, No. 408, dated 19th August 1879, His Excellency the Governor-General in Council expressed his approval of this decision.

New rules.

247. The "new rules" referred to in the preceding para, were drafted by me in consultation with Mr. Garbett, the Superintending Engineer; Mr. O'Brien the Executive Engineer; and Rai Hukm Chand, Assistant Settlement Officer. Their basis was the old rules of 1859, published in Mr. Morris's report, and reprinted in Mr. Thornton's memo, which have been in force down to the present time. They originally had the force of law under the Indian Councils Act, but the passing of the Punjab Laws Act (Act IV of 1872) and of the Canal Act (Act VIII of 1873) rendered their authority rather doubtful, and the changes of the last 20 years made it at any rate necessary that they should be fully reconsidered and published in a revised form. But though revision was necessary we desired to alter the principle of the old rules as little as possible, and we especially desired to retain those provisions which tended to enlarge the liberty of action of the local officer, for it is obvious that elaborate Departmental rules, which may be very suitable to canals provided with full establishments, are quite unsuited to a district where a single Executive Engineer, sometimes with and sometimes without an assistant, is in charge of upwards of 650 miles of main canals. We also proposed to retain unaltered the rules regarding the pancháyats; but we proposed an innovation in the mode of assessing *chers*. One of the great difficulties of the old system had been the minute subdivision of *chers*; of the whole number of men from whom labour was due 42·6 per cent. owed no more than ¼th of a full *cher*, or 22½ instead of 90 days' labour; and this they claimed to give when and where they liked. The result was the greatest confusion in the attendance registers, and numerous complaints of bribery and oppression against the canal moharrirs. We, therefore, proposed that all *chers* owing not more than 22½ days' labor should be made to compound for it, and pay in cash at the rate of 5 annas a day: this commutation money would be at once expended by the Canal Officer on the hire of free labourers, and if the *chers* who had commuted desired to work there would be no difficulty in their recovering their commutation money, and in earning a considerable addition to it. To remedy the annual complaints about the distribution of the *cher* assessment, we proposed that the number of *chers* for each canal should be fixed for 5 years, and that its distribution should be fixed at the same time and only be liable to alteration on its being shewn to be manifestly unjust. One or two additions were made on miscellaneous matters, and rules were provided for carrying out the new system of the assessment of canal lands.

Principle on which they were drafted.

Modification of draft by higher authorities.

248. Certain modifications in the draft rules were proposed by the higher authorities regarding which I expressed my opinion in my No. 209, dated 11th December 1878, to the Superin-

tending Engineer, Deraját circle, and in my No. 158, dated 17th November 1879, to the Commissioner of the Division, I strongly protested against any rule tending to deprive the *zar-i-nágha* of its character of a purely local fund, over which the local officers had full control, and to treat it more as an Imperial fund from which expenditure could only be incurred to the extent of the annual allotments. Such a change would still further increase hoarding of the *zar-i-nágha* which is the great blot of the present system. I also objected to the proposal to raise from 5 to 6 annas a day the rate of contribution of those *chers* whose commutation was compulsory. It seemed to me most necessary that this rate should not be more than the men could earn as free labourers. I also suggested that a rule should be made that the Executive Engineer send in his list of absentees weekly instead of at the close of the season. A fine collected within 10 days of its being incurred has infinitely more effect than one whose collection is delayed for nearly a year.

249. The final orders, which were not received until after the close of the Settlement, were conveyed in the Secretary to Government (Civil Department) No. 696, dated 29th July 1880, which returned the Revised Rules as finally approved. The modifications made by them in our original proposals were :—

Final orders.

(i). The limit within which a *cher* is bound to commute his labour for a cash payment has been fixed at $\frac{3}{16}$ or $16\frac{7}{8}$ days instead of $\frac{4}{16}$ or $22\frac{1}{2}$ days, and the rate to be paid him has been fixed at 6 annas instead of 5 annas a day.

(ii). As the fines due from absentees are not considered due till the close of the season, the proposal for the weekly collection of fines was not sanctioned.

(iii). The petitions for remission were to be enquired into by the district instead of the canal staff. The latter were, however, to take an active part in the supervision of the "girdáwari" by the patwárís which will form the basis of the orders on these petitions.

(iv). Proposed remissions must be reported to the Financial Commissioner for sanction, instead of being granted finally by the Deputy Commissioner. Forms for reporting these remissions are given in the Settlement Commissioner's No. 1560-1, dated 23rd October 1880, to the Deputy Commissioner, Mooltan.

250. The system of assessment devised by Mr. Lyall to avoid the necessity of annual measurements and differential crop rates is described in para. 7 of his No. 130, dated 30th May 1877. Mr. Morris had, at the Regular Settlement, divided the jama of each village into canal and non-canal, and had provided rules for the remission of the former in case the canals failed. But down to the present settlement such a remission had never been granted. One reason of this was that Mr. Morris's jamas as a rule were very light, but even under them some villages have suffered, and no relief was given them because Mr. Morris's rules could not be worked. He contemplated that the Deputy Commissioner and Canal Officers would be able to decide that a canal had failed in some distinct proportion to its full supply, say to the extent of $\frac{1}{4}$ or $\frac{1}{2}$, and that a general order for a similar reduction of the canal jamas of all the villages irrigating from it would give all the relief required. But both these ideas are based on a fallacy. In the first place, it is quite impossible to state that a canal has failed in any definite proportion; in the second place, even if the failure could be thus mathematically defined, a general order for remission in accordance with it would be most inequitable. The circumstances under which irrigation is carried on in the different holdings vary so greatly, some men growing indigo, others only kharíf grain, or even rabi crops, some getting their water through long cuts, others from the canal itself, some being at its tail, others at its head, that it is obvious that a failure of the canal to the extent of one-fourth might ruin the harvests on some lands whilst it would not perceptibly affect it on others. Mr. Lyall, therefore, proposed to treat the holding instead of the village as the unit of the canal assessment, and to adopt the following plan :—

New system of assessment of Canal lands.

Mr. Morris's rules for remission, why a failure.

Mr. Lyall's revised proposals.

(i). The canal jama for the whole village was to be divided into canal and non-canal as by Mr. Morris, but this division was further to be carried out in the bachh in detail for every well or patti returned in measurement as canal irrigated.

(ii). If any well or patti in any year entirely failed to get canal water its canal jama would ordinarily be remitted, and rules would be framed for the grant of partial remission, in case of severe partial failure.

(iii) The annual measurements now made for the canal officer by moharrirs should be made by the patwárís with details for each well and patti. The Deputy Commissioner would then have the statistics which would enable him to report properly on all applications for remissions.

(iv) All lands not included in the above wells and pattis, *i.e.*, not assessed at the present settlement with a portion of the canal jama, will pay a light water advantage rate in addition to their new non-canal assessment, in the event of their taking water hereafter.

These proposal were adopted as the basis of the new settlement, and were entirely approved of by His Honor the Lieutenant-Governor in his orders on the assessment reports for each tahsíl. The rate for new land irrigating hereafter has been fixed throughout the district of 8 annas per acre, to be levied by annual measurement of the area irrigated.

251. A general provision for the working of this system has been made in the new rules. Petitions complaining of failure of water may be given either to the Canal Officer or Deputy Commissioner, and it is of course understood that they will authorise their subordinates, *e.g.*, the Tahsíldárs and sub-divisional Canal officers, to receive them also; to compel every man to march some 40 or 50 miles into Mooltan before his petition could even be taken, would quite defeat the intention of the rules. All petitions must be given in by September 15th; they will be sent to the Deputy Commissioner who after entering them in the *Register* in his office (*vide* Form II of the Revised Rules), will arrange them according to tahsíls, canals, and Patwárís' circles, and forward them to the Tahsíldárs for report. The Tahsíldárs will distribute them to the Patwáris, who will complete their girdáwári in the manner directed by the Financial Commissioner's Book Circular S.—1, dated 23rd February 1881, and note on the back of the petition the canal statistics, with a brief report. Whilst the girdáwári is in progress the patwárís will be supervised by their own officers, *viz.*, the Kánúngos, Tahsíldárs, and their Naibs, and also by the Canal Officers and their subordinates, who will record a memo. in the patwárís' diary of anything requiring notice, and a copy of this memo. will be forwarded to the Tahsíldár by the patwári. On receipt of the petition thus endorsed by the patwári, the Tahsíldár will report on it to the Deputy Commissioner; who will pass orders rejecting it, or including it in the list of remission to be submitted to the Financial Commissioner. To assist the Deputy Commissioner in his work, the Canal Officer will furnish him with a brief general report shewing the working of the canal during the past season. At the close of the girdáwári the patwári will forward to the Canal Officer the statistics for the canal areas in Form IX of the Circular above quoted.

General mode of working the new system.

252. The proviso that a total remission of the canal jama should be granted in cases of complete failure, and a partial remission, at the discretion of the Deputy Commissioner, in cases of partial failure, was embodied in the *Darkhwast*, or tender of engagement taken from the zamíndárs. But the first year's experience of the working of the new system shewed that these clauses as they stood were too vague and were capable of being interpreted in a far more liberal way than was intended by Government. Instances came to light of cases where the total failure was caused by the zamíndars for their own benefit, or where the canal assessment was so light that it shewed that the occurrence of at least occasional total failures had already been allowed for. The report on the remission for 1879-80 caused Mr. Lyall to consider the subject, and gave rise to the correspondence commencing with his Settlement Secretary's No. 26 S. C., dated 27th May 1880

and ending with the orders of His Honor the Lieutenant-Governor contained in his Secretary's No. 1078, dated 5th November 1880.

These orders finally approve of the following Revised Rules for remission as proposed by Mr. Lyall.

Rules for granting remissions of canal or remissble land revenue on the Mooltan canals.

1.—Land assessed below rates: no remission.

I.—No remissions should ordinarily be allowed either for total or partial failure of canal water when the total assessment (fixed and remissible) of the well or patti is much below rates. For it will be considered that the assessment of the holding shows that allowance for such failures has been made in the assessment. The only exception to this rule will be when a severe failure, resulting in large diminution of cultivation or great loss of crop, occurs for several consecutive years. The Deputy Commissioner may then grant some remission if he thinks the assessment, though much below rates, has become temporarily oppressive, owing to the continuous failure. But if the assessment is not merely much below rates, but is exceedingly light and trifling in amount, then no remission should be allowed under any circumstances.

No remission except in case of continuous failures;

and not then if the revenue is very light.

Explanation of assessed below rates.

Explanation.—The total assessment of a holding will be held to be below rates, if the sanctioned revenue rates of the circle (canal and well, or canal alone, as the case may be) when applied to the average annual cultivated area, as ascertained by the settlement measurements and subsequent girdáwárís, give a product above such total assessment.

No remission if canal water is applied to some holding to the neglect of others.

II.—No remission should be allowed if it appear that the applicant has intentionally failed to take water and to cultivate the well or patti in question for the purpose of increasing the cultivation of other wells or pattis in which he is interested.

All river flood and drainage irrigation to be held to be canal irrigation.

III.—As it is difficult to distinguish irrigation, or moistening by river or rain drainage floods, from irrigation by canal water, all such moistening which has benefited a well or patti, will be counted as canal irrigation in dealing with claims to remission.

(ii).—Lands assessed at revenue rates.

IV. When the total assessment of a well or patti is up to, or but little below, the canal and well or well or canal alone, revenue rates of the circle, the following rules will apply:—

Total failure entitled to complete remission.

(1). If no canal water is received during the season, or if the crops sown are entirely spoilt by the canal ceasing to flow, a remission should be granted, provided, of course, that Rules II and III do not apply.

Partial failure does not necessarily entitle to any remission.

(2). If, however, the failure is only partial, that is, if some canal water is received during the season and some crops are grown with its aid, no remission should be allowed merely because the supply has been below the average, for the revenue rates were so pitched as to allow for a considerable degree of fluctuation in amount of canal water received.

Unless it is continuous, and causes much injury.

(3). Some remission should, however, be allowed if the partial failure is both severe and continuous, that is, if in two or more consecutive years the supply of water is so scanty and inopportune as to cause much injury either by diminishing the area of cultivation, or by preventing the cultivation of the usual proportion of the superior crops, or by causing part of the crops sown to dry up.

Examples.

253. Even under the revised rules it may often be somewhat difficult for the Deputy Commissioner to decide how to use his discretion. To guide him in this it may be useful to recall briefly some of the main considerations on which the new assessments were based. As a rule, the assessment of each holding presumes a fair average and a

maximum cultivation; profits and losses of ordinarily good and bad years will be taken and borne by the zamíndár, and it is only in case of severe or long continued distress that he will be entitled to relief for partial failures. It is impossible to lay down any hard-and-fast rule for this; some parts of the district require much more liberal treatment than others, for instance, the Lodhran canals, and especially the Sardarwah, require to be carefully watched, and remissions should, at least for the next few years, be given there for reasons which might not be sufficient elsewhere. In dealing with applications for remission on the ground of partial failure, the first point to be considered is the original incidence of the canal jama of the holding; was it imposed in the belief that nearly the whole area would be constantly under high class crops? or was it supposed that only a part of the land would get water and that its produce would be inferior? For instance, the total area of a holding is 50 bighas: at Settlement nearly the whole of it was under sugar or indigo; it was considered that this would be fairly permanent, and its canal jama was put at Rs. 50 or 60. Here a partial failure may have entirely ruined the superior crop, and unless the previous years have been very good a remission of a part of the canal jama, propably at least half, would be necessary.

Register of irrigated area.

254. Complete registers of all the holdings in detail assessed with a portion of the Canal jama at this Settlement have been drawn up in vernacular and made over to the Canal Officer. An English abstract of them, arranged according to villages, is given in the Appendix M. This shews that for the whole district the new canal jama is Rs. 2,74,609; the former canal jama (Appendices H. and I of Mr. Morris' report) was Rs. 1,97,393, so that the increase is Rs. 77,216 or 39 per cent. The total jama (canal and non-canal) of the villages irrigating is—Former Rs. 4,05,426; Present Rs. 4,83,016; which is an increase of Rs. 77,590, or 19 per cent.

Canal jama to be credited to the Canal Department.

255. This is the real canal jama which is remissible in case of the failure of the canals. But the jama for which the Canal Department is to take credit as a matter of account is not this jama but a nominal jama of two-thirds of the jama actually distributed on the canal and well lands, and the whole of that distributed on the simple canal lands at the present Settlement. I had proposed that the Canal Department should only take credit for the remissible jama, but the Financial Commissioner in his Secretary's No. 494—2868, dated 21st April 1879, ruled that, inasmuch as the destruction of the canals would render cultivation even by wells impossible in many parts of the country, it was not too much to allow the Department to take credit for the whole of the canal alone and two-thirds of the canal and well jama, although it was unnecessary to treat the whole of this as remissable. The jama thus to be credited to the canals is also shewn in the appendix. It is Rs. 3,11,005, which is Rs. 36,396 more than the remissible jama. It may be noted that in the Lodhran tahsíl the actual remissible jama is greater than the jama to be credited to the canal under the above rule. Of this the following explanation is given in my No. 829, dated 14th May 1881 (as Deputy Commissioner, Mooltan), to the Settlement Commissioner:—

"The reason why in the Lodhran tahsíl the jama to be credited to the Canal Department is less than the actual canal jama is that the great indigo villages are those to the tail of the Sardarwah and Mahomadwah canals in the Ráwá assessment circle, where a well alone can pay very little, but when aided by canal water it can pay a great deal. A mere Ráwá well would pay about Rs. 14, but when aided by a canal it can pay Rs. 70 or 80. Assuming the jama in the latter case to be Rs. 75, then under the general rule two-thirds of this, or Rs. 50, would be credited to the Canal Department, and Rs. 25 treated as the non-canal jama, whereas in real assessments the proportions would have been nearer Rs. 60 and 15."

I think that the whole of this jama should be credited in the accounts to the Canal Department.

Cash commutation for chers.

256. The above jama will be credited to the canals *merely as a matter of account on paper*. But the canal officer will receive from the Deputy Commissioner in actual cash the sums paid for the commutation for *chers*. The "tarafs" of Mooltan have never given *chers*;

they have always paid a cash commutation instead, and this arrangement has been continued at the present Settlement. Their commutation has been fixed at a lump sum of Rs. 2,750 for the khalsa lands and Rs. 163-8 for the mafi lands, calculated at 8 annas per acre on the irrigated area. This will be collected by the Tahsíldár under the name of the canal *cher* cess, and paid to the personal Deposit account of the Canal Officer. Small commutations for *chers* were also paid in a few other villages in the Mooltan tahsíl, but they were severally paid not by the village as a whole, but only by the holdings which began to take canal water after the Regular Settlement. At the request of the Canal Officer most of these cash commutations have now been abolished and the holdings made liable to give *chers* like their neighbours. In four villages, *viz.*, Ruknabad, Bahránwala, Birapur and Samu Raman, which are practically a part of the tarafs the cash *ábiána* has been retained, but it has been raised from Rs. 24 to Rs. 173. The Canal Officer should be particularly careful that the whole of this commutation money is spent every year in the employment of free labour to assist in the clearance of the particular canal for which the commutation is paid, and it would be as well if these labourers were engaged when the *chers* are first called out so that the fact of their employment may be evident. The villages who give *chers* have often complained, and justly, that they have to do their own work and the others' too.

No record made of rights to water.

257. No attempt has been made at the present Settlement to draw up any record of rights to take water. I thought of making such a record at the beginning of the Settlement; I proposed to take each canal separately, to take up in order each water-course issuing from it, and to record who made it, what villages, and what holdings in each village, irrigated from it, the extent of their irrigation, and their rules for the distribution of water. But I soon found that the task would be an overwhelming one, and there was great danger of stirring up disputes where none exist at present, and of stereotyping as permanent rights which may be only temporary. There was a danger too that a record might fetter the power of distributing water which the Canal Officer possesses under the Canal Act. I therefore give up the idea of framing a record of rights in water, and I have merely recorded the proprietorship of the water-courses themselves.

Rights in water courses.

258. All the smaller courses in private lands of course belonging to the zamíndárs who constructed them or through whose lands they pass. The usual custom is that, if *A* constructs a water-course to his own lands across the lands of *B*, it is recorded as "the property of *B*, in the possession of *A*." *A* does all the clearances and repairs, but *B* takes the *sarkanáh* and trees growing on the banks; should the water-course be disused for any great length of time, *A's* right in it would cease, and he could only restore it with *B's* permission. This was the general arrangements before the Canal Act came into force, but now a man wishing to take a new water-course over another's land generally applies to the Canal Officer to acquire the land or a right of way for him under the Act: sometimes he himself comes to terms with the other man by giving him a share in the water or some other advantage. Where private water-courses cross the Government waste, the land remains the property of Government which takes the trees and *sarkanah* growing on the banks in lieu of rent; should it be thought better to take rent in cash, I have suggested to the Deputy Commissioner that this should be fixed at 8 annas an acre, and the rights to trees, &c., would of course be surrendered. But I am very doubtful if any rent either in cash or trees should be taken, for it is very desirable that every facility should be offered for the extension of irrigation. The sum charged as rent would always be very trifling but the collection of these petty dues often causes a great deal of annoyance.

In the main canals.

259. The main channels of the canals were as a general rule recorded at the Regular Settlement as the property of the villages through which they passed. At the present Settlement the question came before Government, and orders were conveyed in the Secretary's No. 2291, dated 12th June 1874, to the Secretary to the Financial Commissioner, that the "lands so occupied should, with the exception—

"(*a*) When the canal was made before the village;

"(*b*) When compensation has been paid for it;

"be recorded as at the previous Settlement, *viz.*, in most instances as the property of the villages.

"2. As in the case regarding the land occupied by the Western Jumna Canal, on which orders were conveyed in this office No. 3625, dated 3rd September, 1873, the Lieutenant-Governor considers the securing an exclusive right of occupancy sufficient, and would not press a claim for proprietary right except in the case of lands surrounding Government buildings, such as Inspection bungalows, &c., in which it is necessary that Government should hold an unconditional title."

The right of occupancy herein referred to has been secured by entering the land occupied by the canal as "Mukbuza Sirkar," and by stating in the Wajib-ul-arz that Government has a right of occupancy as long as the canal is in use, and all trees and other produce on the canal bank belong to Government.

Sirkari Lahrs.

260. Besides the main canals, the following main distributaries are known as "Sirkari Lahrs :—

Canal.		*Sarkari Lahr.*
1. Mathital ...	...	Lahr Kandewali.
		„ Jalálshah.
2. Khadal ..	... 1.	„ Chauki Alimpur.
	2.	„ Jadid.
3. Taharpur ...	... 1.	„ Athangal
	2.	„ Taharpur.
4. Dauráná Langáná 5. Shahpur 6. Wali Mahomed	...	*Nil.*
7. Sikandrabad ...	... 1.	Lahr Bhangiwah.
	2.	„ Khandar.
	3.	„ Kamandi.
	4.	„ Daúd Shah.
8. Gajju Hattah ...	... 1.	„ Kusturewah.
	2.	„ Nagniwah.
	3.	„ Jamiabiwah.
	4.	„ Killuwah.
	5.	„ Rajawah.
	6.	„ Damiwah.
	7.	Kassi Bágh Shalamar.
9. Bakhtuwah ...	... 1.	Lahr Sarwarwah.
	2.	„ Baghi.
	3.	„ Nagni and its branches—
		1. Kassi Nagini.
		2. „ No. II.
		3. „ Babar Khanwah.
	4.	Lahr Sher Shahi and its branch. Kassi Sher Shahi.
	5.	„ Jhangiwah.
	6.	Kassi Mubarik Bagh.
	7.	„ Khairpur.
	8.	Lahr Warianwala.
	9.	„ Santwala.
	10.	„ Chatiawala.
	11.	„ Kamuwala.
10. Dhundon ...	... 1.	Kassi Dhundon.
	2.	„ Nagini.
11. Paujani ...	...	*Nil.*
12. Sikandarwah ...	... 1.	Lahr Ghazipur.
	2.	„ Vitah.
13. Bilochanwala ...	...	*Nil.*

Sutlej Canals.

1. Diwanwah 2. Jamwah Khurd 3. Chatturwah 4. Jamwah Kalan	...	*Nil.*
5. Kabibwah ..	...	Lahr Dilawarwah.
6. Sadikwah ...	...	„ Uchalwah.
7. Sultanwah ...	... 1.	„ Nazarwah.
	2.	„ Badarao.
8. Bahawalwah Mailsi	...	Baradarwah Mailsi.
9. Abanwah 10. Jamraniwah 11. Muhammadwah 12. Diwanwah	...	*Nil.*

Canal.		Sarkari Lahr.
13. Sirdarwah ...	...	Bihisti
14. Shekhwah Sharkiah	. 1.	Lahr Kadirwáh.
	... 2.	„ Jaminwah.
	3.	„ Aliwah.
15. Shekhwah Gharbiah		„ Dandwala.
16. Bahalwalwah (Lodhran)		
17. Mubarikwah ...		
18. Khanwah ...	...	Nil.
19. Hafizwah ...		
20. Bahadarwah ...		

The lands occupied by these Lahrs have been recorded both at the Regular and present Settlements as the property of the zamíndárs, and the clearances have been affected by them, though the *chers* of the villages irrigating from the Lahr on their own account, after the clearances of the main canals were completed; on the other hand, the Canal Officer has maintained more or less of a supervision over them, and a full control over the trees and *sirkánah* growing on the banks, and when any has been sold he has credited the proceeds to the Canal Department. At the commencement of the present Settlement the zamíndárs claimed this produce. Their claim was not advanced in a regular suit but only in a general petition. A reference was accordingly made to Government, and the orders of His Honor the Lieutenant-Governor were issued in the Joint-Secretary Irrigation Branch, P.W.D., to the Secretary, Financial Commissioner's No. 5699 T., dated 23rd December 1878, sanctioning the insertion of the following clause in the Wajib-ul-urz of the villages through which these Lahrs pass, "subject to a right of way for the water, the land through which the Lahr passes is the property of the zamíndárs, but the trees and *sirkánah* growing on its banks are the property of Government. If any cultivator in the village through which the Lahr passes requires a tree or trees for his *boná fide* agricultural purposes, he shall apply to the Canal Officer, and the Canal Officer will give him a suitable tree free of cost."

These orders have given very general satisfaction, and have been accepted as a complete settlement of all claims.—(*Report on Mooltan Settlement by Roe, paras.* 62 & 238—260).

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Copy of paras 8—18 of a note by J. B. LYALL, Esquire, Financial Commissioner, Punjab, on the utilization of patwáris for canal measurements in Mooltan.

8. I have given above a summary of Major Wace's arguments and proposals, and a note of my own opinion on them. But the questions in hand seem to require a survey of the whole system of canal management and of assessment of canal land revenue in Mooltan. Unless those whole systems past and present are kept in mind, misunderstandings seem to me to be likely to occur.

I propose, therefore, to prepare a more definite explanation of my own recommendation by briefly explaining the systems in regard to (*a*) measurements of canal irrigation, (*b*) remission of canal land revenue, (*c*) assessment of canal land revenue on land not canal-irrigated at settlement, (*d*) assessments of the demand for *cher* labor which have hitherto been in force, and the alteration, if any, whether as yet sanctioned or not, which it is now proposed to introduce.

9. The measurements of canal irrigation have hitherto been effected by some 41 moharrirs and some 82 chainmen, engaged for four months of the year only, and working from about the beginning of August to end of November or later. They are paid from imperial funds, and their measurements are tested by the canal daroghas, who are allowed two chainmen each for the purpose, but the testing is very partial, as the darogha's establishment is so small. These moharrirs measure each irrigated field with the chain and so get its area; they form the fields anew each year with reference to the limits of irrigation and cultivation they see on the ground, and give in a return of area irrigated, crops grown, &c., which is in khasra form, but also gives ordinarily the totals for each well or patti: as the measurements are made to run as much as possible *chahwar* and *pattiwar*; some 7 moharrirs are temporarily entertained in the canal office to check these khasras and the areas for wells and villages; and an English-writing clerk or two are also employed to to make English abstracts showing the totals for villages and for canals. The primary object for which the measurements are made, is to supply the statistics for the Canal Officer's reports, but the measurement papers are also useful for reference in case of appeals to the Canal Officer about inequality in *cher* labor assessments. This information about canal measurements is drawn from Mr. O'Brien's No. 296 of 1st March 1889, and from notes of conversation on *cher* assessments, dated 2nd April 1880.

10. The remission of canal land revenue has hitherto been entirely in the Deputy Commissioner's hands. Mr. Morris, as Settlement Officer of Mooltan, divided the jama of each canal-irrigated village into two sums, fixed and remissible, and proposed, when a canal ran badly, all the villages should get a rateable reduction within the limits of their remissible jama. This was sanctioned, but this plan of only dealing with each canal as a whole was really impracticable, and was never worked. The few remissions granted within term of settlement for failure of canal water were given only when the Deputy Commissioner's attention was attracted by the difficulty of realizing the revenue, and were passed under the general rules for remissions for calamities of season, not under Mr. Morris's special rule. The canal measurement papers were not available to the Deputy Commissioner; he could of course have asked the Canal Officer for a return as to the irrigation of any particular village or holding, but I believe that hardly any enquires of the kind have been addressed to the canal officer. The remissions proposed by the Deputy Commissioner for the Financial Commissioner's sanction have been based on the reports of the Tahsíldárs, though the canal officer has no doubt been generally consulted.

11. Under the settlement which has now expired, nothing extra was payable by land to which canal irrigation was extended after the settlement was made. There has been much extension to, or in, many villages on certain canals, and as such a thing as a new *báchh* (or redistribution of demand within villages) has been unknown, much land has been held for many years in such villages at absurdly light rates of revenue or even *absolutely* revenue-free. Such land has, however, been rated with its share of *cher* labor.

12. The system of annual assessment and distribution of the demand of *cher* labor, which has hitherto prevailed, is fully described in a note of mine, dated 2nd April 1880, which is appended. It will be seen that the Canal Officer (within the maximum fixed by the Settlement Officer at last settlement) has annually fixed and announced the total demand for each canal, that the canal *punch* or munsiff has annually distributad this demand among the villages, and that the lambardárs have made the interior distribution within the villages. It will be noted that these distributions have not been based upon the annual measurements made by the canal moharrir, but that in hearing appeals the Canal Officer has relied upon those measurements as the main ground of his decision.

13. I now come to the question of what changes have been sanctioned at this settlement, or are now proposed under the four heads of work described in the last four paragraphs. As to the head (D), *i.e.*, the assessment and distribution of the demand for *cher* labor, the only change of system to be made at this settlement is that now sanctioned in the new *cher* labor rules, whereby the maximum number will be fixed for 5 years only, not for term of settlement, and will always be called out, and whereby the general mauzawar and ásámiwár distributions will be made quinquennially not annually: no other change is proposed. The canal officer will retain, as before, the full management of the distribution of the *cher* labor and of the assessment of the demand for *zar-i-nágha*. The subject is really only concerned with this reference in so far as it is affected by the question of canal measurements by patwáris instead of by canal moharrirs. It is not really connected therewith, as the canal moharrir's measurements have not been the basis of the *cher* labor distribution though they have been used by the canal officer as a check in appeal. The patwáris' measurements will also not be the basis of the distribution, but they will do equally well as a check.

14. In respect to heads B and C, *viz.*, the remission of canal land revenue and assessment of a canal-advantage rate on new canal irrigation,

Government has tentatively approved, in its orders on the Assessment reports, of a condition of settlement whereby (1) wells or pattis (as the subordinate holdings in villages are called) will under certain conditions get remission in whole or part of their canal or remissible revenue, in case of total or continuous and severe though partial failure of canal water,* and (2) wells or pattis not assessed as canal irrigated at this settlement will pay a canal-advantage rate on any field to which canal water may be extended.

As far as can be foreseen the assessment of this canal-advantage rate on extensions of canal irrigation is not likely to give much trouble or to bring in much revenue. Almost all the canals have already been extended to the utmost of their capacity, and every well or patti which has hitherto got a supply of canal water, however uncertain or scanty, has been treated as canal-irrigated in the present settlement. So, unless large works in the way of widening and extending the canals are undertaken (which does not seem probable), the area assessable with the rate will be at first *nil*, or extremely small, and will increase very slowly. It is not intended that a mere accidental flooding of land, due to bursting of banks or the running away of water at the tail of a canal in an exceptional season, shall be treated as an extension of canal irrigation and chargeable with rate. When an extension to a new well or patti does occur it will generally be patent enough; a new *kassi* or watercourse will have to be made, or an old one extended, and the well or patti will also be brought by the zemíndárs themselves on to the roll of *cher* labour assessment. For the above reasons, the assessment of the canal-advantage rate is not likely to be a difficult or heavy piece of work. It is the claims for remission of canal land revenue which are likely to give trouble. In some exceptional years they may be numerous, and they will always require much care and judgment in their disposal, for the question whether a remission should be given or not, and if given to what amount, must be a matter of discretion; no-hard-and fast rule can be laid down. For this reason and for the reasons given by Major Wace, I am strongly of opinion that the Deputy Commissioner, with the assistance of his Assistants and Tahsíldárs should, as heretofore, investigate and dispose of all claims to remission and should also assess and collect the canal-advantage rate. We think the district revenue staff is the best machinery for the purpose, and that it will be able to do the work. We also think that the Canal Officer and his small establishment will have quite enough to do, if, as heretofore, they manage the engineering of the canals, and the assessment and distribution of the *cher* labor. The Deputy Commissioner would of course invite the Canal Officer to express an opinion before finally disposing of claims to remissions and would inform him of the assessments of canal-advantage rates, but the responsibility for the detailed inquiry and final order in each case would be with the Deputy Commissioner. The primary inquiry would ordinarily be made by the Tahsildár to whom petitions would be sent by the Deputy Commissioner. The Canal Officer could send any petition presented to him direct while on tour to the Deputy Commissioner for his orders. If this view is approved it will be admissible to alter a little the working of Rules 31 and 32 for working the *cher* labor lately sanctioned by Government, as the rules in question seem to imply that the primary investigation into all such claims to remission will be made by the canal officer and his subordinates. I shall accordingly, by separate letter in reply to Secretary to Government, Irrigation Department, No. 523 of 23rd February last (on the subject of *cher* rules), propose an alteration of the kind. But it will be convenient if Government will dispose of the question of principle on this letter.

15. I now come to the question of measurements of canal irrigation. Mr. Roe, Major Wace, and myself agree in opinion that it is necessary for the proper working of the Mooltan canal revenue assessments and for the due preparation of the patwárís' annual papers, that a careful field-to-field girdáwári shall be made annually by the patwárís, and we think that with the aid of the new settlement maps this girdáwári can be made in such a way as to give us returns of canal irrigation sufficiently accurate for the disposal of claims to remission and the assessment of canal advantage rate; also sufficiently accurate to supply the Canal Officer with all the statistics he requires either for his reports or for the disposal of *cher* assessment appeals. Instructions for working this girdáwári and the form to be used, have been drawn out very carefully by Major Wace, and have again been revised in this office, and in respect to one or two minor points are still under consideration. These instructions will have eventually to be submitted to Government for sanction in the Civil Department. To avoid any increase in the number of returns due from patwárís, it has been arranged that the girdáwári return shall take the place of one of the annual papers. It does not, however, seem necessary to encumber this reply to Government in the Irrigation Department by connecting with it the reference about the girdáwári. I hope General Gulliver will accept, tentatively at any rate, my own and Major Wace's opinion that the girdáwári will supply a sufficiently reliable statement of the facts of irrigation.

* Note.—It may be mentioned here incidentally, that one of the conditions of remission, as they stand at present, is shown by experience to be too hard and fast and to be likely to encourage unnecessary claims for remission. In reporting in a separate letter upon the remissions granted for last year, I shall propose to Government to alter this condition in finally sanctioning the settlement or previously.—J. B. L.

We propose that the Deputy Commissioner, through his Assistants, Tahsíldárs, and Kánúngos shall be responsible for the testing and check of this girdáwári, but that the Canal Officer shall also be invited to satisfy himself of its general correctness by testing it personally, or through his darogahs, while in progress. I also suggest that some of the darogahs should be made over for the time to work with the kánúngos under the Tahsíldár in supervising the measurements. From the girdáwári papers the patwárís would prepare for each village, to be sent to the Canal Officer, a statement in much the same form as the khasra now prepared by the canal measurement moharrirs, and giving all the same information but in abstract for each holding without detail of fields. The local officers, canal or settlement, who were consulted in Mooltan, seem to have all agreed that detail of fields will not be required by the Canal Officer.

The form of statement would be as follows; it is based upon the form of khasra now used by the canal moharrirs, modified to ensure easy compilation from the form of girdáwári paper we intend to use :—

Girdwári number.	Name of well or jhalar or patti.	Number of proprietor's holding in the Settlement Khewat Khatauni.	Proprietor's name, parentage, caste, and residence.	Name of cultivator, his parentage, caste, and residence.	Detail of Irrigation.				Name of canal &c. of cut.	Detail of area under each crop for the holding.		Remarks including note of demand for canal-advantage rate when due.	Nature of crop.
					Number in Settlement Khasra of fields irrigated.	Total area of holding irrigated by canal by girdáwári.							
						By flow.	By lift.	Total.		Kharíf.	Rabi.		

From these statements the Canal Officer would, as at present, compile in his office, with the aid of moharrirs and clerks, all the Vernacular and English registers and statements which he requires. He would also use these statements to help him in deciding *cher* labor distributors' appeals, for which purpose they would be at least as convenient as the canal moharrirs' measurement papers. It must be remembered that the Settlement Officer had made over to the Canal Officer full copies of the Settlement Khewat Khatauni papers for all irrigated holdings. These papers give in detail the area and class of each field in each holding and the revenue demand for the holding fixed and remissible. With these papers and the annual girdáwári statements the Canal Officer will, I think, have all the information he can require either for reference in case of disputes or for the purpose of satisfying himself of the general correctness of the returns of irrigation.

16. A patwáris' girdáwári will have to be made in any case for the patwáris' annual papers; if however, it is to also take the place of the present canal measurements, it will be much more carefully made and supervised.

If the canal measurements are given up there will be a saving in the Canal Department of above Rs. 4,000 per annum, which will, I imagine, be very acceptable, as the Canal Officers have long been asking for an increase of their subordinate engineering establishment, and also for the appointment of a Deputy Collector or Native Assistant.

17. Major Wace proposes that the patwáris shall get nothing from the Canal Department for the girdáwári or for the statements they will submit to the Canal Officer. The girdáwári is no doubt the patwári's proper work and the statement of irrigation will not take long to prepare or cost much in ink and paper. I am, however, myself decidedly of opinion that it will improve the pace and character of the work and some friction, if the Canal Officer is allowed to expend a sum of, say, Rs. 1,500 annually in payments to those patwáris who have given in their statements of irrigation punctually and in proper form. The distribution of the Rs. 1,500 could be based upon the relative areas of canal irrigation of their circles at time of settlement, and the sums could be given nominally to cover the cost of compiling the statement from the girdáwári and copying it out. The patwáris could then be pressed if necessary to employ relations of their own to do this work for the girdáwári papers of one village, while they themselves were carrying on the girdáwári of another. The payment of this sum of Rs. 1,500 would of course by so much reduce the saving available as a set-off against extra canal establishment. But as the canal revenue has largerly increased at this settlement, Government will probably agree to some increase of establishment independent of savings.

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7. I pass on to the third group, in which the prosperity of the district at large is really involved. I have some difficulty in dealing with the assessment of the canal villages, apart from the questions arising out of the existing canal management. And I am aware that I raise a most serious and inconvenient issue when I express doubts as to the suitability of a fixed assessment for this part of the district also. I had very little knowledge of the district, when as Settlement Commissioner, I wrote the review accompanying the Settlement Officer's Report, and I was not at that time aware that the settlement was otherwise than well-suited to its circumstances. I still think the average incidence of the assessment as explained in para. 11 of that review is fair, though not so light as might be inferred from the areas classed as cultivated in the Settlement Officer's statistical tables. But I am now throughly dissatisfied with the internal distribution of the assessment; and on a closer knowledge of the district, I think the conditions of its agriculture are such as to make the fair distribution of a fixed assessment an impractical task.

8. When I commenced my tour I had no inkling that a conclusion of this nature would be forced on me. But I was led by my observations to inquire into the real incidence of the revenue on the holdings of which the villages are made up. There are no real village communities in the Mooltan district. The agriculture is organised by holdings, each holding having usually a well. The well alone is not sufficient to support agriculture unless aided by canal irrigation, and the joint interest of adjacent wells in an irrigating cut taken out of a canal is usually their only common tie. To sink the well and to make the canal cut or both of them initial operations requiring a considerable expenditure of money. Nor can the well be worked except with several yokes of strong oxen, which again cost money, and the annual silt clearances of both canal and branch cutting are a further steady drain on the owner and culivator. The effect of a fixed assessment under circumstances of the nature is very favorable to a prosperous man of influence with money at his command; but on the average agriculturist it may at any moment fall with severity. Any calamity, pecuniary or domestic, diminishes his ability to meet the heavy current expenses of his holding, and the more he contracts his operations, the heavier the incidence of the fixed assessment on the remaining cultivation. This is what is now happening in many a holding in the Mooltan district, and so long as the fixed

assessment system is maintained, I see no possibility of avoiding it. In a sub-Himalayan district, the cultivator ploughs, the heavens send rain, and a crop is reaped. The rain and the crops are fairly constant, and the expenses of cultivation are light. The conditions of agriculture in the Mooltan district are wholly different; if the canal supply is fairly good, if the water course is properly cleared, and if the well is properly yoked, there is a crop: failing either of these conditions there is no crop. Men of small means struggling on under such conditions deserve the most careful consideration at our hands, and the existing form of the assessment does not give it to them. We merely assess a fixed sum, and then (saving only evident and serious failure of canal supply) levy it rigidly. Men of resources, on the other hand—for example, the large agriculturist and the money-lender—profit greatly. Given fair canal management, they extend the area of their cultivation, and the number of their wells and the incidence of the fixed demand soon falls to a low figure.

9. After I had seen reason to think that the assessment was probably working in this way, I caused two or three of the canal-irrigated villages to be examined daily by the District Revenue officer. I give below an analysis of the results, so far as I can do so from the notes furnished.

1	2	3	4	5	6
				Incidence per acre of crops cultivated in Kharif 1884 and Rabi 1885.	
Tahsil.	Circle.	Village.	No. of holdings.	Holding paying highest incidence.	Holding paying lowest incidence.
				Rs. A.	Rs. A.
Shujabad ...	Utar	Basti Mitthu	18	2 5	0 12
	...	Wais	13	4 0	1 0
	Hitar	Mochipur	5	5 0	0 5
	Utar	Halal Mujja	6	4 1	1 1
	...	Gamin	10	4 8	0 8
	Hitar	Panjani	7	2 8	0 8
	Utar	Kotli Nájabat	5	1 2	0 2
	Rawa	Thek Kalan	6	1 9	0 10
Lodhrán ...	Banger ...	Jalalpur	8	2 4	0 8
	...	Basti	5	3 0	0 3
	Hitar	Basti Lang	7	1 15	0 10
	...	Umarpur	7	1 15	0 10
	Khadir ...	Khanwah	9	4 10	0 3
	Bangar... ...	Tibbi Ghallian	8	1 1	0 6
		Koreshiwala	7	1 9	0 5
		Lodhran	9	2 11	1 3
		Thadda Thaim	8	2 6	1 0
		Dorutta	8	4 0	1 15
		Laluwala	10	3 8	1 8
		Thatti Saalija	36	2 8	0 4
		Dhanot...	17	2 0	C 3
		Wahi Lao	16	4 8	0 5
		Kahror...	63	4 0	0 8
		Rajepur	136	4 8	0 5

1	2	3	4	5	6
Tahsil.	Circle.	Village.	No. of holdings.	Incidence per acre of crops cultivated in Kharif 1884 and Rabi 1885. Holding paying highest incidence	Holding paying lowest incidence.
				Rs. A.	Rs. A.
Mailsi ...	... Bangar...	... Jamraniwah	195	4 8	0 3
		Dhorewala	34	1 4	0 5
		Mahomed Morád	19	2 7	1 0
		Amirpur	12	2 4	1 9
		Sharakwah	25	1 15	0 13
		Kikri Kalan	51	4 4	0 7
		Kot Mozaffar...	30	1 4	0 4
	Adjoining Rawa	Karampur	54	4 0	0 4
		Zorkot	47	2 12	0 2
		Ludan	102	5 0	0 4
		Bud Ghilam	10	0 15	0 4
	Adjoining Khodir	Khangah Islam	24	3 0	0 2
		Salol	21	1 7	0 2
		Dudu Kamera	19	2 0	0 2
	Khadir... ...	Lakha	11	3 0	0 11
		Saldera	27	2 8	0 5
		Sahuke	28	4 0	0 8
		Bhatta...	13	3 5	1 0
		Morad Ali	7	2 13	0 12

[The last five villages are at the extreme end of the Mailsi tahsíl, and are not as yet advantaged by canals.]

I have not in every case stated the highest incidence, because this occurs on holdings which would be better treated as having for the time fallen out of cultivation. Nor have I noticed the number of holdings assessed with revenue, which have no cultivation at all, though these occur in every village. To facilitate the fuller comprehension of the subject, I append to this note a concise table showing the particulars of which the above abstract shows only the highest and lowest extremes. I feel sure that an inspection of this table will further justify the anxiety with which I regard the working of our fixed assessments in these tracts.

10. The great divergencies of incidence are not explainable on the ground of variety of soil or other natural advantages. The soil of each village is of very even quality. The divergencies are due to fluctuations of cultivation; and though the fluctuations in a village or group of holdings taken together may be traceable to canal supply, the fluctuations of each individual holding depend in a much greater degree on the personal circumstances of the owner; on the money he can command; on his relations with his tenants; and on his own personal freedom from domestic trouble or pecuniary embarrassment. It is not the case that the internal distribution of the assessment, was made without care. The Settlement Officer caused a statement to be drawn up, village by village, showing for each holding its previous assessment, and the sum due by his rates and by the produce estimate, and the opinion of the owners was recorded after consideration of these data. Except when their proposals were obviously unfair, the new demand ultimately charged to each holding was very much what the owners considered appropriate in each case. But there is reason to think that the holdings of influential men often escaped with too small a

charge. And so far as either the assessing officer or the owners relied on stated areas of cultivation, these areas in many cases did not represent the real state of affairs; and with every subsequent change in the individual circumstances of the owners the basis of the assessment is by so much falsified.

Lutfpur case. Canal remissible revenue and additional charge on new irrigation.

Lahore Commissioner's No. 924, date 5th November 1885, and Deputy Commissioner's No. 730, dated 17th October 1875 (*without Appendices.*)

11. As an independent illustration of the difficulties which are involved in the maintenance of a fixed assessment in the canal-irrigated tracts of the Mooltan district, I append copies of a report recently received from the Deputy Commissioner of Mooltan on some village in the Lodhrán tahsíl. I earnestly invite the most careful perusal of this letter. The state of affairs represented is typical of what occurs when canal irrigation fails for any reason, and also of the difficulties with which an owner is confronted when he once falls into debt. And this letter appropriately leads on to another important feature in the Settlement, the working of the rules for remission of fixed Canal Revenue, and for the assessment of newly irrigated land, which are given at pages 142—6 of the report. These rules assume that a fixed demand has been imposed on all land irrigated by canals at the time the assessment was made, and provide for its remission on grounds of failure of irrigation supply. They also direct that on land not so advantaged at the time of assessment an 8-anna canal rate shall be charged if irrigation is subsequently extended to them. The irrigators fully understood the general tenor of these rules, and in distributing the fixed assessment of each village over its holding the owners took care to charge as much land as possible with a portion to the fixed canal demand, for the obvious reason that land not so charged would be liable to an additional 8-anna rate.

And the owners freely resorted to another evasion of the rules. They perceived that by putting a less quota of the fixed canal demand on the holdings regularly irrigated, and a disproportionately large quota on the holdings of which the *irrigation was uncertain, they would* probably be able not infrequently to obtain remissions of some of *the canal demand. In not a few* instances part of the canal assessment was put on the holdings *that had not* recently been cultivated at all. It was for several reasons difficult for the Settlement Officer to contend against practices of this kind. Sanction to the assessments was held back to the last stage of work, and it was then necessary to press operations to a rapid conclusion. There had been no annual crop inspections, and the entries of cultivation in the Settlement record represented a single observation made more than three years before the assessments were announced and distributed. When the Settlement Officer found out the way in which the irrigators were working to evade the rules, he caused the papers of every village to be examined, and cut down holding by holding the areas alleged to be covered by the fixed canal demand. But even so, he has failed to correct at all adequately what can only be described as a fraud on these rules, committed by the owners with the double object of securing frequent remissions and of limiting the area to which the new 8-anna rate could be charged.

See para. 285 of report.

Finally, the rules themselves are not of easy application. Their intention is that no remissions shall be allowed, if the assessment is trifling or much below rates; otherwise if no water is received, or if crops fail, remission is to be granted; but not if the failure is only partial, or if the owner deliberately neglected to take water that was available to him. The circumstance that a holding was assessed below rates also affects its claim to remissions. The abstract merit of these rules is of less importance than their practical working. Mr. O'Brien was, I think, the first officer to complain of the difficulty of applying them, and I wish now to endorse this opinion very strongly. They are good directions to the Deputy Commissioner for his general guidance, so far as they go; but they are so complicated as to be difficult of application. And they make the claim to remission turn mainly on the character of the canal supply; whereas an owner's failure to irrigate will frequently be due to his inability to spend money on his water-courses and to meet the demands of the *cher* system. They moreover impose a very onerous burden on the Tahsíldárs and Deputy Commissioners; and as a Deputy Commissioner can seldom

feel certain that the circumstances of a holding have been fully reported, it is very difficult for him to see his way. The whole results of these rules are a very good illustration of the technicalities and difficulties in which we involve ourselves, when we attempt to apply a system of fixed demand to agriculture of which the conditions are variable, depending not merely on uncertain canal supply, but also on the ability of the irrigator to meet recurring annual expenditure on his wells and village water-courses. To apply such a system to a sturdy thrifty population free of debt would have been a sufficiently critical experiment. But in this district we have forced it on a population whom we knew to be deeply embarrassed with debt, and of whom the Settlement Officer (not, I think, with entire justice or full appreciation of their difficulties) writes that they are ignorant, careless, and destitute of energy. They are certainly not all wanting in such sharpness as shall enable them to take the best advantage of Government's rules.

See pages 30 and 31 of the Settlement Report.

12. I now proceed to consider the suitability of the existing canal administration to the circumstances of the district. This is a question as vital to its prosperity and progressive development as the form of the assessment, indeed more so. No doubt the possibility of avoiding, now or hereafter, serious fluctuations of the Land Revenue income depends on the good management of the canals. But to the agriculturists who are dependent on the canals, the character of the canal management involves the whole difference between the success and the failure of the agriculture on which they depend for support. The land-owners of this part of the Punjab are peculiarly dependent on their tenants, and also on the assistance of small money-lenders. Every canal failure means a shifting of these tenants to a more successful canal: nor will money be advanced, except in proportion to the assurance of successful irrigation.

13. During the course of the settlement operations, and subsequently the whole canal system has been very fully discused, so much so that authority can be quoted for almost any view any of us may now wish to urge. The principal papers are quoted in the margin. The outcome of a long discussion has been very little change on the pre-established system. All attempts to give up the *cher* system have failed, the only step finally made in this direction being the entry of a condition in the Settlement engagement to the effect that Government retains the option of abolishing it at any time on any canal. The local *cher* rules have been revised, the alterations being carefully limited to what all authorities considered necessary. And the most important of these alterations appear to me to be—

Secretary to Government, Punjab's No. 215, dated 30th January 1884,
Proceedings Pnnjab Government, Revenue, Agricultural and Commerce Department, No. 8 of August 1875.
" 8 of September 1875,
" 20 of May 1879.
" 21 of May 1879.
No. 3 of July 1879.
" 3 of September 1879,
" 3 of April 1880.
" 14 of Jnly 1880.
" 7 of March 1883.
" 1 of June 1885.
Do. Irrigation Department, September 1880.
Revised Settlement Report, pages 136–150.

(i) An administrative direction, under which the total *cher* labour demanded from each village is distributed over the irrigators according to the area actually irrigated, and not, as before, at the mere discretion of the lambardárs without direct reference to that area.

Revised Rule 14.
Proceedings, Government, Revenue and Agricultural Department, No. 1 of June 1885.

(ii) Distinct provision for the quinquennial revision of the total demand for *cher* labor on each canal; a revision which appears to have been intended by the previous rules, but not to have been carried out.

Revised Rule 13.

(iii) the extension of this principal of a fixed *cher* labor demand from canal units to village units.

These are the changes which really come home to the irrigators; and owing to numerous petitions recently sent by post in some numbers to Government and to other authorities concerned, I discussed them very carefully with all persons concerned during my present tour. As regards the petitions, I may say at once that they are untrustworthy. The signatures may or may not be real—they often are not, and it is easy to obtain them. But my march through

the district showed very plainly, both to myself and to the officers who were with me, the conflict of interests which provoked them. The more influential men and owners have in the past usually evaded a full contribution to the *cher* demand, and under the new arrangements this is not possible. That is the chief cause of the petitions, and I shall not further refer to them; but confine my remarks to an attempt to search out what in personal contact with both owners and cultivators appeared to me to be their real needs.

14. So long as we were not able to secure fairly reliable annual measurements, it was necessary to assess the total *cher* labor due from each canal at a fixed amount. But the system is fundamentally wrong; for the labor required each year will vary primarily with the development or shrinking of the irrigation. It varies with other circumstances; but these are the most important factors. Again, the longer the term for which the total *cher* demand is fixed, the greater will be the difficulty of readjusting the demand to altered circumstances at the close of that term; or if the effective irrigation is shrinking, the greater will be the difficulty of the irrigators in meeting the fixed demand, until the time comes for its revision. Take, for instance, the Mattithal canal of the Chenab series; the *cher* demand fixed in 1880 is 100 laborers; in 1885 it is 150. On the assumption that the latter assessment is correct, the necessity for an increased labour contribution was probably increasing all through the five years, 1880—85, but the fairness and necessity for the increased demand does not make it a bit easier for the owners and tenants to meet, when it comes suddenly on them in 1885. The owners say with truth that a sudden increase of the *cher* demand on a holding will frequently break a tenant, or give him sufficient motive for leaving.

If the circumstances of our administration are such that we cannot avoid these abrupt changes, then let us accept the necessity as a necessity. But if we can avoid them, it is our duty to avoid them. There is, in my judgment, no necessity whatever for a system involving such changes. We now have very fair annual measurements, and the *cher* assessment ought to be fixed, at say, one day's labour for every bigha irrigated. The exact rate is a matter for detailed consideration. I am only stating the principle—so much water, so much labor, every one charged evenly, and no one either over-charged or under-charged. This *cher* demand is a costly and severe strain on the agricultural population. To represent the system as cheap and falling lightly on the irrigators is a great misconception. No doubt the continuance of the system is for the present necessary; its sudden abolition would be a hazardous and unjustifiable speculation; but we are bound to distribute the demand equally; we have not hitherto done so; the existing rules do not provide for its even distribution; and it is my duty to advise Government to substitute rules which will distribute it equally. The irrigators and our irrigating Engineers are both equally disadvantaged by a system of assessments which disregards changes for continuous periods of five years—the Engineers because the demand adjusts itself but slowly to current circumstances; the irrigator, because there is no fair and even distribution of a demand which in the best years he meets with difficulty.

15. The further development of the system of fixed demand, involved in the quinquennial fixation of the contribution of each village, appears to me to be open to still greater objection. What it means to the individual irrigator is that his personal contribution will be enhanced in proportion to the failures of his neighbours in the same village. When a holding fails to use the available irrigation supply, either that holding must give its quota of labour notwithstanding that failure, or the quota contributed by its more successful neighbours in the same village must be increased in proportion. I can suggest no escape from this dilemma. For the unsuccessful holding to resign its irrigation, as is provided by the rules, is an impracticable remedy, why should a man in trouble resign his one hope of recovering himself? As above renarked, with reference to the assessment of a fixed demand on the whole canal, so with reference to the assessment of a fixed demand on the village; if we really cannot avoid such a system, let us say so, and this is sufficient justification for it. But we can avoid it, and therefore it is not justifiable. We tax each village with a considerable

Revised Rule 16.

Patwári cess in order to secure a correct year-to year record, and each irrigator should be charged in proportion to that record; no one should be over-charged on account of his neighbour's failure to irrigate; and those who are unfortunate enough to have no irrigation should not be pressed to contribute, nor be laid under future disabilities in consequence. It is idle to look for prosperity in a district where principles of this nature are ignored in the most vital operations of our current administration.

16. I now come to a point which involves very difficult issues, and which, so far as I can judge, has mainly for that reason been hitherto evaded. The irrigators complain that the fines paid by absentees are not spent in supplying the place of absentees. The reason why they lay stress on this point is, that unless these fines are so applied, the days of attendance of every *cher* laborer who does not default are by so much enhanced. Given the necessity for the *cher* system, I can conceive no more reasonable complaint. We are, I think, bound to search out the merits of this complaint, and to remove all justification for it. It is as old as our first connection with these canals, and has never yet been properly faced. Neither the rules of the expired Settlement, nor those of the new provide for the strict expenditure of absentee fines (*nágha*) on the employment of substitutes, and if we are now to meet adequately the irrigators' complaints on this head, this can only be done by removing the difficulties which have hitherto prevented our Engineers from meeting so reasonable a request.

See Mr. Morris's report, paras. 30, and 45 to 49, enclosed in Government's No. 215, dated 30th January 1874. Revised Rules 5 and 27.

17. With special advertance to this last remark, I think it worth while to draw attention to one bearing of the existing *nágha* system, which is not apparent on its surface. The absentee fund (*nágha*) is at present used as a sourse from which exceptional demands for expenditure may be met. Occasions for special expenditure arise on every inundation canal, and I have satisfied myself by careful discussion of the point with the irrigators and with the irrigation officers, that in the Mooltan district it would not be possible to meet all such demands by enhancement of the *cher* assessment. It is therefore to the interest of all that there should be a kind of insurance fund to which all irrigators shall contribute, and from which each canal can be helped as occasion arises. The *nágha* or absentee fund at present serves this purpose; and if instead of being so applied, it were spent, as the irrigators desire, in providing substitutes in place of the absentees, either the burden of the existing *cher* system would be occasionally so much enhanced as to be felt very severely, or the Government must be prepared to make an additional contribution to current expenses, which would certainly not average less than Rs. 50,000 per annum; or, failing this contribution from Government, a small cash rate of two or three annas per acre irrigated must be charged to the irrigators in addition to the demand for *cher* labour. Again, if the present *nágha* fund stands in the place of an insurance fund, necessary to the light incidence of the *cher* system, it is pertinent to ask whether the irrigators contribute on a fair system. A little consideration will show that they do not. On a canal, where the ratio of the absentees is low, the contribution is proportionately small, and it will increase as the ratio of absentees rises. *Quá* absentees, there is not much objection to this; but as the work which the absentees should have done is thrown on those who have not defaulted, the governing principle of our existing insurance system reduces itself to this, that the necessary insurance fund is provided by throwing on to those who attend at the works the labor which should have been done by absentees, *i.e.*, the more numerous the absentees, the greater is the insurance contribution demanded from those who are not absentees. This is clearly wrong. It is moreover well-known that the absentee fines now barely represent the value of the labour due from absentees, so that the absentees really pay nothing to the insurance fund. I am told that the whole *cher* system is one of compromise, and that I should therefore overlook inequalities of this nature. Whether it was right to accept such a position 30 years ago is a question on which I express no opinion, but that it is right to continue it for another 20 years, I cannot admit. The irrigators do not think it right, and if we can by a re-adjustment of the system meet their feelings on the subject, it is incumbent on us to do so. How severely the present system falls on the *cher* laborers who do not default, in the case of those canals where the proportion of absences to attendance is high, will be abundantly apparent to any

one who will look carefully through columns 5 and 6 of Return No. 6 appended to this note. And over and above such inequalities as are there shown, I have authority for saying that the *cher* assessments are on an average pitched one-third higher than is necessary, with reference to the expected work, merely to make sure that the actual attendances shall be sufficient. That an allowance of this amount should be admittedly made in all our *cher* assessments is strong evidence of the extent to which the burden borne by those who attend is enhanced by the present system of alienating the absentees' fines from their proper and original purpose of supplying the place of the absentees.

18. Though I am unwilling to add to the length of this note, it seems incumbent on me to notice in this connection the results of the quinquennial revision of the *cher* assessment, which was made at the close of the cold season 1884-85.

Joint Secretary to Government, Irrigation Department, No. 4257, dated 29th September 1885, and enclosure, and No. 4098 dated 15th idem, and enclosures.

The correspondence is appended. On a first perusal of the papers I gathered the impression that the *cher* assessment has been unnecessarily enhanced, and that the new assessment contemplated the employment of *cher* labor on improvements and extensions to an extent, and in a manner, not authorised by Revised Rules 27 and 5. A number of petitions addressed both to Government and to myself, to which I have already referred in para. 13, asserted that this was in fact the character of the new assessment. During my tour through the Mooltan district, not only the village headmen, but also members of the tenant irrigating class on every canal, where called before me, and in conversation with them, with the Land Revenue Officers, and with the Irrigation Officers, I satisfied myself that my first impression and the assertions made in the petitions are unfounded. The *cher* demand for each canal, has been carefully and suitably adjusted to its existing circumstances and even where the increases appear largest, there has not been any general enhancement of the demand from each village or holding, but rather a call on villages and holdings previously under-assessed to contribute their due quota. The irrigators are consequently (with unavoidable exceptions) quite satisfied with the new assessment. And I think that the Superintending and Executive Engineers (Messrs. Garbett and Pargiter) are entitled to much credit for the manner in which it has been made. Assuming the continuance unaltered of the existing system, the assessment ought not to be lower; and in respect of its distribution over villages and holdings, it is incomparably better than any previous assessment. The persons who are now for the first time required to pay a fair quota (for the most part large land-owners and persons of other influence) are interested in urging a different conclusion. But if such favouritism and partiality as has been common in the past were not eliminated from the future working of the system, its administration would become increasingly difficult. And even those hitherto unfairly advantaged cannot stand up before their fellows and claim the continuance of an uneven assessment.

19. These papers bring another question into view, which seems to me to deserve serious consideration. In our anxiety lest the *cher* labor should be over-assessed, and the labourers detained too long from their holdings we have tied the hands of our Engineers from employing the labour on works of the first importance to the proper distribution of the water. The waste of labour and water commonly involved in the existing system of minor water-courses is indescribable; it must be seen to be understood. It may be appreciated in part by an examination of the irrigating systems delineated on the large map (2 miles=1 inch) of the Mooltan district; and it is more particularly described in the extract from the Executive Engineer's letter which is enclosed with the Joint Secretary, Irrigation Department's No. 4257 of 29th September last. Mooltan is not a district in which the irrigators have an over-abundance of either money or labour, and as yet our canal management has done little towards lightening the cost of distributing the water beyond the channels of the main canals. We have merely kept the main channels in working order, and improved their alignment as we found occasion. And we have so framed our rules that the labour and funds at the command of the Canal Engineer cannot be applied to the improvement of the distributaries. In my opinion this limitation on the employment of the *cher* labour is one of the chief faults of the existing

system; it perpetuates all the waste of capital, labour and water involved in a system of distributaries usually wasteful and ill-designed beyond all description. There are no doubt great objections to any too hurried attempt to amend these defects, and the officers of the Irrigation Department are already so heavily charged with current duties in connection with these canals that they are not likely under any circumstances to move rapidly in this direction. But they should have free discretion to apply the *cher* labour for the general improvement not merely of the main channels, but of the whole distributing system. They should be made responsible for all improvements which tend towards reducing the cost at which the water is distributed. To the irrigators we should say that we demand from each man a certain moderate quota of labour, and claim for ourselves the liberty, in consultation with the headmen of each canal, to employ that labour as we judge best. To the Canal Officers, we should say that we hold them responsible not merely for the main supply, but also for its proper distribution, and for the prevention of waste; and the rules should give the Canal Officer sufficient liberty and discretion to discharge this responsibility. The existing restrictions are not in the irrigator's favour; on the contrary, they are chargeable with no inconsiderable share of the cost and uncertainty of his husbandry, and they also hinder equally the development of that husbandry and of the State's revenue.

See para. 256 at page 146 of Revised Settlement Report.

20. I also draw attention to the obvious unfairness of the fixed commutation of the *cher* labour due from the estates known as the Mooltan city tarafs. The commutation has been assessed at Rs. 2,750, on the assumption of an annual irrigation of 5,463 acres. This area has now risen to 5,754 acres, and (assuming the value of *cher* labour at a daily rate of six annas) this area, if charged at the same rate as is now actually contributed in *cher* labour by other irrigators on the same canals, ought to pay an annual commutation of Rs. 4,314. But the commutation has been assessed at Rs. 2,750 for the term of settlement, and if the settlement is confirmed by Government, these city tarafs (which contain the most profitable agriculture in the whole district) will for that term be enjoying their irrigation at a charge much lower than is paid by the other irrigators of the same canals for less valuable cultivation. This is not a question between Government and the city estates; it is a question between these estates and the other villages supplied by the same canals, unless indeed I am to assume (what I fear is not improbable) that the commutation money is spent rather on extraordinary works than on ordinary clearances. These commutation arrangements for the Mooltan tarafs should therefore only be sanctioned on the express understanding that the cash commutation is subject to revision on the same terms, and at the same intervals as are prescribed from time to time for the assessment of *cher* labour.

Probable future prospects of the *cher* labour system.

21. Probably none of Government's officers, who are brought into close contact with the *cher* labour system, will escape feeling some impatience of its continuance, and the desire to substitute for it cash assessments on the irrigation and hired labour on the works. Certainly all the officers who have hitherto dealt with the *cher* system have at one time or other tried to see their way to this change. It is not for me to say whether it will ever be practical, or to advocate on abstract grounds a change which will affect in a vital degree the interests both of the irrigators and of the State; but the settlement now under consideration has practically entrusted the future treatment of the question to the hands of the Irrigation Department. The change will never be practicable at one bound. If it is ever carried out, it must be done (as Government's last orders contemplate) gradually, canal by canal, as changing circumstances make it practicable. The idea that a change of this nature can safely be carried out *per saltum*, when a new settlement is made, has been too long entertained, and this idea is really the chief obstacle to the treatment of the question in accordance with the changing circumstances of the country. Irrigation Officers are rightly prone to defer to the authority of Land Revenue Officers on a point of this kind; they have no clear idea of what a settlement is, except that they know it to be an operation which on past occasions has introduced most important changes, assumedly

Page 146 (para. 245) of Revised Settlement Report.

beneficial, which are beyond the scope or power of any ordinary administrative agency. If therefore Land Revenue Officers encourage the belief that it may be possible at some future revision of settlement to pass suddenly from *cher* labour to hired labour, the Irrigation Department are very likely to rest on this view, and to accept the *cher* system as a whole, applicable necessarily to the whole district. But our hope of making progress towards its abolition really depends on the extent to which the irrigators themselves repudiate it, and on the Canal Officers carefully observing the progress of this repudiation. I invite attention to columns 5 and 6 of the appended Canal Statement No. VI.

That statement gives for each canal in even hundreds of rupees the average annual value for the past five years of canal labour under three heads, *viz.*:—

Columns 5 ... ... Absentee fines.
,, 6 ... ... *Cher* attendances.
,, 7 ... ... Total of both.

This return shows that already for the whole canal system one-third of the *cher* labourers prefer to pay a cash fine rather than give their labour in person, or (to keep our conclusions within safe limits) let us say a fourth of them prefer the cash alternative. But on individual canals the proportion of absentees is much higher, especially in the Shujabad tahsíl and in the neighbourhood of Mooltan itself. Take, for instance, the case of the Dauráná Langáná, or of the combined Bakhtuwah and Dhundi. On these canals, during the past five years, one-half of the *cher* labourers have defaulted and elected to pay a cash fine rather than attend. Whether under such circumstances the *cher* system ought to be continued appears to me extremely doubtful, and these cases illustrate forcibly the growing necessity for applying scrupulously the fines paid by absentees to the employment of hired substitutes. The absentee figures are no doubt higher during the past five years than they will be in the ensuing five; for they include compulsory commutations of fractional *cher* demands under Revised Rule No. 21, which compulsory commutation will not in future be enforced. But after an allowance of this nature has been made, it would still appear that on some canals near Mooltan a considerable number of persons do not desire the continuance of the *cher* labour system. Even in these cases I do not desire to precipitate action towards the abolition of *cher* labour, nor do I wish by any argument of mine to under-rate the great difficulties with which the Irrigation Department contend in finding such hired labour as they at present employ—difficulties much aggravated by the extensive Railway works now in progress, where very high wages can be earned. But I do wish to emphasize the responsibility of the Canal Officers for the continuance of the *cher* system, after the time when a majority of the irrigators of a canal have themselves repudiated it. The minority who still desire to labour in person can always come on to the canal works, and if they are poor and need aid in paying a cash irrigation rate, they will go to the works and earn money for the purpose. Even if the change on any canal proved unfavourably to its efficient maintenance owing to the difficulty of finding hired labour, the lesson would not be without its value. It would have been brought on the particular canal by the preference of the irrigators themselves as expressed by the high ratio of absentee fines; and having given an unfavourable result, it would operate to strengthen on other canals the preference of the irrigators for the old *cher* system. And though it may not be correct to say that the *cher* system depends solely on such a preference, and not very largely on the State's authority approving and enforcing that preference, still for its satisfactory working and for the contented acceptance by the irrigators of the somewhat burdensome demands which it involves, the system undoubtedly depends for its success very much on the conviction of the irrigators that it is on the whole the best for their own interests.

I therefore urge that the question of the continuance or abolition of the system should in future be regarded not as decided by settlement arrangements, but as dependent on the current requirements of the canals, and on the judgment of the Irrigation Officers in respect of these requirements; on the other hand, it is incumbent on the authorities responsible for the revenue assess-

ment, so to adjust that assessment that it shall be practicable for the Irrigation Officers to apply absentees' fines scrupulously to the payment of hired substitutes. And I also urge that when a majority of the irrigators of any canal by their own action repudiate the liability for personal labour, that liability should not be enforced against the minority; but that on such canals, the Government and irrigators should be required to accept the risks of the abolition of the *cher* system as is provided by the existing Settlement engagement.

22. It remains to consider a question of no less importance than those already discussed. The time is long past, if it ever existed, when in considering the merits of a settlement we could overlook the consideration of the fairness to the State's Treasury. And it is all the more impossible to do this in the present instance, because the canal system has yet to be devised, which shall not necessitate a large recurring annual expenditure from the State's revenues. If our assessments are framed so as to yield no proportionate returns to such recurring expenditure, or so as to defer such returns to a distant date, it is inevitable that the expenditure on these canals will be proportionately stinted. As a matter of fact, a very slight inquiry into the circumstances of these Mooltan canals will satisfy any of us that an unwise stinting of expenditure has occurred, and now continues, being necessitated by the small returns and their slow growth. To aid me in considering this part of the question, the Canal Officers have supplied, at my request, eight statements which are appended to this note, and which are the foundation of the opinion I am now about to express on this division of the subject.

(I) Area irrigated for ten years past.
(IA.) Diagram of the same.
(II) Value of *cher* labour for five years past.
(III) Ten years' account of the Nágha Fund.
(IV) Nágha income and expenditure, Chenab canals.
(V) Ditto Sutlej canals.
(VI) Nágha income and expenditure with value of *cher* labour added.
(VII) Imperial expenditure.
(VIII) Revenue of past five years.

23. The main facts of the question are represented by the following figures [000 omitted]:—

Reference.	Year or period.	Chenab Canals.		Sutlej Canals.		Total District.	
		Acres irrigated	Canal Revenue	Acres irrigated	Canal Revenue	Acres irrigated	Canal Revenue.
			Rs.		Rs.		Rs.
Canal Report (Appendix C) with 1st Settlement Report	1859 ?	76	129	93	106	169	235
Proceedings, Government (R.A.C. Department), No.—of August 1875, page 22 ...	1868—72	114	...	215	...	329	...
Canal Return 1., herewith	1875	119	...	159	...	278	...
	1879	127	...	141	...	262	...
	Average of 5 years, 1875-79	141	...	149	...	290	...
	1884	176	...	196	...	372	...
	Average of 5 years, 1880-84	163	...	179	...	342	...
Revised Settlement Report, Appendix M, and Canal Return VIII., herewith ...	1880	...	148	...	115	...	263
	1884	...	152	...	124	...	276

[The canal-irrigated area stated in Appendices A and M of Revised Settlement Report is not correct, as will be seen by comparison with Appendix MII.]

The net results of the above data may be reduced to the following condensed form:—

Period, A.D.	Per cent. increase of.	Chenab Canals.	Sutlej Canals.	Total Canals.	Explanation.
1859 – 1879	Effective irrigation ...	85	60	71	Area of 1859 compared with average of 1875—79.
	Canal Revenue	15	9	12	
1880—1884	Effective irrigation ...	16	20	18	Average area of 1875 – 79 compared with 1880—84.
	Canal Revenue	3	8	5	
1859—1884	Effective irrigation ..	115	92	108	Area of 1859 compared with average of 1875—79.
	Canal Revenue	18	17	18	

A statement of this nature places clearly before us the cost of maintaining in these tracts a system of fixed assessment. In 1859 the average incidence of canal revenue per acre irrigated in the Mooltan district was a little over 22 annas per acre. In 1875, before the introduction of the revised assessment, this incidence had fallen to 13½ annas. The revised assessments raised it in 1879 to 14½ annas. It now stands at only 13 annas. As the development of the canals will certainly proceed, the incidence will no doubt have fallen in another 10 years to 10 or 11 annas per acre irrigated. Of the gross annual revenue sacrificed, some idea may be formed from the following calculations:—

Take the future average canal irrigation at 350,000 acres (a low estimate), this area will bring in a revenue—

At Re. 1-4-0 per acre Rs. 4,37,500.
,, ,, 0-14-0 ,, ,, ,, 3,06,250 (loss on previous rate, Rs. 1,31,250 per annum.)
,, ,, 0-12-0 ,, ,, ,, 2,62,500 (loss on 1st rate, Rs. 1,75,000 per annum.)

In the above calculation I have taken only gross figures. If individual canals were taken, the inequalities of the present system would be still more marked. For example the irrigation of the Sikandrabad canal in the Chenab system was 16,000 acres in 1859; it now irrigates 43,000; its Canal assessment was Rs. 27,000 in the former year, and is now Rs. 34,000, that is to say, the irrigation has increased 168 per cent., but the revenue only 26 per cent: or take the case of the Diwánwah (Mailsi) on the Sutlej; in 1859 it irrigated 10,000 acres, assessed at a canal revenue of Rs. 8,500; it now irrigates 42,000 acres, assessed at Rs. 18,500; the irrigated area is four times what it was, the revenue as only doubled. These or two of the most prosperous canals in the district, but the district offers a wide field for canal development, and assuming (as I think we may) that the management of the Mooltan canals is steadily improving, and that funds will be forthcoming with this object, the two cases quoted by me illustrate the nature of the return which under the existing system of assessment will be secured to the State. If this development of irrigated cultivation was primarily due either to the capital or industry of the land owners, much could be said against any proposal to increase the revenue in proportion to the increase of irrigation. But the increase of irrigation both in the past has depended, and in the future must still depend, on the efforts of Government's Irrigation Officers, and on the annual expenditure by Government of a very considerable portion of the Canal Revenue.

24. The annual expenditure from the Nágha Fund, which may be taken as expenditure on improvements and on repairs for which the *cher* labour was insufficient, has averaged for the past five years over Rs. 1,13,000 per annum. The expenditure from Imperial revenues for the same period has averaged—

See Returns III and VII.

	Rs.
Extension and improvements	3,000
Maintenance and repair, including tools and plant ...	13,000
Executive establishment	52,000
Direction*	28,000
Total annual average	96,000

If the *cher* system is to be put on an equitable footing, either an assurance rate must be levied from the irrigators, so pitched as to bring in an annual income of about Rs. 80,000, or an equivalent sum must be added to the charges already met by the State. Apart from this question, it is surely open to some argument whether the State is right in contributing to repairs, improvements and extensions of this large and valuable canal system, only the paltry sum of Rs. 16,000 per annum. A revenue of five lakhs hangs upon it, though technically only three lakhs is reckoned as canal income. The Nágha Fund is not likely ever again to have a balance of from two to three lakhs of rupees at its command. This balance was created by accumulations husbanded during a time when

* I have taken the cost of direction in 1884-85 at the same sum as in the previous year.

schemes for extensive remodelling of the canal system in this district were in view. When those schemes were definitely set aside, six or seven years ago, it became necessary to incur the expenditure requisite for the efficiency and improvement of existing main channels. This expenditure has exhausted all the available balances, and the Rs. 60,000 still remaining represents the lowest limit to which it is safe to reduce the funds at command. The amount of the future income is also uncertain. That of the past five years has been swollen by the compulsory commutation of fractional demands, a practice which it has been found necessary to discontinue. And for all these reasons, it is probable that, even were the existing system maintained unaltered, Government could not much longer avoid a substantial and annually recurring cash contribution towards the maintenance and improvement of these canals. I invite attention to the very high rate of *cher* assessment (nearly one ninety day unit to 30 acres irrigated and in many instances even severer than this) which has prevailed for years past on not a few of the Sutlej canals. The meaning of these high rates is that cultivation has shrunk, because the irrigation has ceased to be reliable and abundant, and the Canal Officers cannot mend matters, except by a considerable expenditure on improved heads. When a canal is working well a demand of one *cher* (90 day unit) per every 50 acres irrigated gives the Canal Officer all the labour he requires for ordinary clearances and petty improvements. When a canal begins to work badly, cultivation shrinks, while the same amount of excavation work is required in the main channel, *plus* additional heavy work for an improved head. The canal for the time being is a bankrupt concern, the *cher* assessment and the land revenue assessment, being fixed quantities, become increasingly oppressive as cultivation shrinks, and nothing can mend matters except prompt and liberal expenditure at the head, and the consequent restoration of an efficient and reliable supply. It is not too much to say that unless the Canal Officers in the future as in the past continue to have at their command for urgent works a sum of about Rs. 80,000 per annum, the incidence of the *cher* labour will rise steadily; and on all unsuccessful canals it will (as indeed it already is) be distinctly burdensome, and a state of affairs will not improbably arise which will necessitate large reductions of assessment and greatly injure the prosperity of all but the largest landowners. In fact, it would tend towards making the whole system most unpopular, and the canals themselves unprofitable to Government.

Revised Rules 21, para. 3, Secretary to Government, Irrigation Department's No. 2421, dated 9th May 1885. Proceedings, Revenue and Agriculture Department, 1st of June 1885.

See comparative abstract showing *cher* assessment of Sutlej canals, which is the first Appendix to Irrigation Secretary's No. 4257 dated 29th September 1885, Canal Nos. 11 to 19.

25. In advising Government as to the course which in view of all the circumstances above urged should now be taken, that is to say, whether the settlement should be sanctioned and for what term, I am sensible of the serious responsibility which I have to incur. I trust that nothing which I have said will be understood as in any way depreciating the ability and care of the officers by whom the settlement was made and controlled. Their work was carried out under difficulties of organisation and procedure from which Settlement Officers of the present day are comparatively free. The task which the officers who made the settlement set before themselves, was the continuance of the pre-existing system, with as few changes as possible, and all their proposals and measures were framed with that object, and had the intermediate approval of the controlling authorities and Local Government. It has been my duty to deal with the results, as established after five years working of the new settlement, and there is a wide difference between foreseeing results and judging of them after their occurrence. The power of withholding sanction to a settlement is a power which, though provided by law, has never yet been exercised in the Punjab, and which the Government will be unwilling to exercise in proportion to the time during which the results of the settlement have stood unchallenged. Nor do I think that in this case any useful purpose would be served by resorting to such an exceptional remedy.

The settlement ought certainly to be sanctioned, if only for the purpose of validating the action of the past seven years during which it has been current; but excepting only as regards the villages under fluctuating assessment, where the existing settlement is working well and gives satisfaction to all interests concerned, I cannot recommend that the settlement be sanctioned for 20 years, as was originally intended, or for a longer term than is necessary to validate past proceedings, and to provide time for a well-considered choice of the principles on which the revenue should be hereafter assessed. In the villages under fluctuating assessment,, the settlement should be sanctioned for 20 years reckoned from the date when the new assessments began to run.

26. In recommending a more restricted sanction for the rest of the district, I am not influenced mainly by the consideration of the pecuniary loss to which Government would be exposed were the settlement sanctioned for the full term. If the Government have tacitly approved an insufficient or unprofitable assessment, the mere delay in the final formal sanction is not a circumstance of which I could recommend Government to take advantage. And in dealing fifteen years ago with the settlement of the Lahore and Amritsar Divisions, the Government of India accepted a considerable loss of revenue rather than disappoint expectations reasonably arising from the action of the chief local authorities.

The case under consideration is entirely different. The canal management has not yet been put on a satisfactory footing, and (excepting only the lands inundated directly by river floods) the assessment, equally that of revenue and that of canal labour, has not been properly distributed, and cannot be unless material alterations of system are introduced.

27. So far as I can at present see, a system of fluctuating assessment ought to the applied to all those portions of the Mooltan District not at present so assessed. The conditions of agriculture are not stable, and depend on the successful application of both labour and capital to wells and to canal cuts, and also on the success of the canals themselves. If an agriculturist has a crop, he should pay a fair revenue and furnish a moderate quota of canal labour. If he has no crop, his losses should not be aggravated by a revenue demand. No form of assessment or administration will effectively help those who are habitually reckless and unthrifty. The agriculturists at the other end of the scale, that is to say, the wealthier and influential men, get on well enough under any form of assessment; they can contend with the burden of a fixed assessment, and also with the worries of a fluctuating assessment. There remain the interests of those whom I still believe to be the majority of the agricultural class, *viz.*, those owners and tenants who, though not entirely free from the faults commonly attributed to agriculturists in this district, are yet possessed of land, means, credit, and energy sufficient to enable them to contend successfully with the difficulties of their position, provided only our demands for revenue and canal labour are fairly adjusted to current circumstances. It is to the requirements of this last class that our system should be adjusted, and I do not myself see how this can be unless we are willing to face on the Mooltan canals (as we have successfully done on the Indus, Chenab and Sutlej alluvial, and on the Bári Doáb, Sirhind and Jumna Canals) the difficulties of a fluctuating assessment.

28. The year-to-year assessment of canal labour, according to the area irrigated and according to a fixed rate, is, I think, very generally desired. Among all the tenants, at least, it would be highly popular. Local opinion in favour of the year-to-year assessment of revenue would be more slowly declared, and would depend much on the amount of the rates and on other details. But I think it safer to face difficulties of this kind than to burden with a fixed assessment agriculture which struggles with many difficulties and disappointments.

29. I also think it a false kindness to the district to maintain a canal assessment system, under which the revenue will not swell in proportion to the success of the canal administration. Say or promise what we now may, the Government's money and the services of its best officers will not be given to canal systems which yield no proportionate returns. The officers of Government who finally deal with proposals for large expenditure are compelled to give a preference to the schemes which will yield the best returns. And if we maintain in Mooltan the present inelastic assessment, we must take the consequences in stinted supplies of funds and consequent uncertain working of the canals. (*Note by Second Financial Commissioner on the Mooltan Settlement*).

F.

Papers on the Government Inundation Canal (the Sidhnai) recently constructed in the Mooltan District.

No. 12, dated Lahore, 8th January 1886.

From—J. Wilson, Esquire, Offg. Senior Secretary to Financial Commissioner, Punjab.
To—The Junior Secretary to Government, Punjab.

In continuation of my No. 1199, dated 4th December 1885, and with reference to your No. 870, dated 16th December 1885, on the subject of the Sidhnai Canal, I am directed to submit, for the consideration of the Lieutenant-Governor, a copy of a further Note on the subject by the Second Financial Commissioner, dated 5th January 1886.

Note by Lieutenant-Colonel E. G. Wace, Second Financial Commissioner, Punjab, dated 5th January 1886.

With reference to Government's intermediate reply to my proposals for the assessment of lands irrigated by the Sidhnai Canal, from which reply, as well as from verbal communication with the Hon'ble the Lieutenant-Governor, I find that the grounds on which my proposals rest are not fully understood, I ask permission to place on record the following further explanation.

2. The assessment of canal irrigated land in the Punjab is at present governed by two Acts, the Land Revenue Act, 1873, and the Northern Indian Canal and Drainage Act, 1873; and there is a fundamental difference in the systems of assessment provided in these Acts.

3. The Canal Act of 1873 expresses the results of a system built up from experience gained in the administration of the perennial Sub-Himalayan canals constructed in Gangetic and Jumna Doábs and in the Upper Bári Doáb. The conditions under which these canals irrigate land are briefly as follows:—

There is a local rain-fall sufficient to support agriculture; and agriculture existed and paid a considerable revenue to Government before these canals were made. The expenses of cultivation were small as compared with those incurred in rainless tracts. A great number of the owners held in small holdings and cultivated their own lands. And finally, in the Jumna and Gangetic Doábs, where our canal irrigation system was first developed, tenants usually paid cash rents. It was on the basis of these circumstances that the system of assessment of water-rates, which has received its final expression in Section 36 of the Canal Act, grew up, being applied first to the canal irrigation of the Ganges and Jumna Canals, and subsequently (from the year 1857) to the Bári Doáb Canal. This assumes that the acceptance or refusal of water will be at the option of the agriculturist; it deals directly with the occupier; and if water is accepted, the water-rate is levied from him. And in cases in which the occupier is a tenant holding under a landlord, it involves the assumption that the landlord's rent will be fixed with due consideration of the water-rates thus paid by the tenants.

4. Shortly after the introduction of the system on the Bári Doáb, our Settlement Officers found that its application of this system in that Doáb was not entirely satisfactory. The land revenue was assessed, not on cash rents, but on a valuation of one-fourth or one-sixth of the gross produce of the land. This system of assessing land revenue was forced on us partly by the almost complete absence of cash rents, and partly by the circumstance that the owners for the most part cultivated their own holdings; but mainly for this reason that previous Governments had always (either themselves or through lessees) levied their revenue in the form of a share of the produce, which in these Sub-Himalayan tracts, with an abundant rainfall, was commonly fixed at more than one-third produce. With the introduction of last land revenue assessment this old revenue share of the produce survived as the rent due from a tenant to his owner, and fluctuated in amount according as the land was irrigated or not. Settlement Officers were called on to assess as land revenue the share thus due to Government on canal-irrigated lands. But Mr. Prinsep pointed out that the canal supply was not constant, depending partly on the canal administration and partly on the option of the tenant, and finally induced the Government to accept a system, of which the main points were these—

(*i*) it remained at the option of the occupier to take or refuse canal water, paying a water-rate in case he took the water;

(*ii*) the land revenue was assessed at the sum which could be fairly demanded if no canal water was supplied;

(*iii*) the additional revenue fairly claimable by Government from the owner's rent in the event of the occupiers accepting canal water was to be chargeable in addition to land revenue, harvest by harvest, whenever canal water should be supplied.

This addition to the previous system is expressed in Sections 37 to 41 of the Canal Act. It was originally described as the water-advantage rate, but is now more commonly known as the owner's rate.

The expediency and utility of this system depends entirely on local circumstances. If, consequent on the introduction of canal irrigation, the owners rents are greatly raised, it is reasonable that the State should take its customary share of those rents; the more so as (on the assumption) this rise will be due to the capital expended by the State in the construction of the canal. Nor has it as yet been contended that this owner's rate should be exhibited in the financial accounts otherwise than as canal revenue.

On the other hand, the assessment of this owner's rate on the Western Jumna Canal has been a matter of much difficulty; and the cases on that canal are numerous in which, if canal irrigation were withdrawn, the State would not only lose the owner's rate, but also be compelled to reduce materially the sums assessed as land revenue.

5. The system of assessment prevailing on canal-irrigated lands in the rainless portions of the Punjab south-west of Lahore is entirely different; it has grown up from circumstances antecedent to our rule, and may by so much be said to be not of our own creation. Cash rents are almost entirely absent. The produce of the land is assigned to the several parties interested in it, according to ancient customary shares. Nominally the tenant's share is from two-thirds to three-fourths; but certain privileges, always allowed to him in respect of fodder crops, increase the proportion of the produce really retained by him to 75 or 80 per cent. The remainder is known as the "*mahsúl*" (revenue) share; and before our rule this share went to the State. (I omit mention of the owner's *lech*, which was usually 6¼ per cent. of the gross produce, as unimportant for the purposes of the present argument). At annexation we assessed our land revenue at a cash valuation intended to represent half of this *mahsúl* (revenue) share; and require the owners to contract to pay this in the form of a fixed annual revenue.

6. This revenue was first treated in our accounts as land revenue. But it needed only a short experience of the administration of such districts as Dera Gházi Khan, Muzaffargarh, Mooltan and Montgomery to show that their agricultural welfare depended directly on irrigation; and that with rare and limited exceptions that irrigation could be supplied in sufficient quantities only by natural flood inundation, or by canals. The administration of the canals again presented novel problems of no little difficulty: ordinarily they supply irrigation only during the months when the rivers are in flood; the heads are liable to frequent change, involving serious recurring outlay; their waters are loaded with silt; and the labour necessary for the annual clearance both of the main canals and of the distributing water-courses is a most serious addition to the expenses of cultivation in a country where labour is scarce. These difficulties have resulted in a steadily increasing demand on Government for canal establishments and canal expenditure; and this again has forced our Revenue Officers, from time to time, to consider what portion of the revenue claimable by the State should be exhibited in the accounts as dependent on the canals, that is to say, as canal revenue.

7. A just decision on this point is of incalculable importance to the welfare of the rainless tracts of the Western and South-Western Punjab. The control and detailed distribution of large bodies of water is a costly and arduous undertaking, involving the gravest issues to the population of the tracts to which it is supplied and to the revenue drawn by the State from those tracts. If the irrigation is irregular and unreliable, the interests of that population and of the State suffer in an equal degree. If it is efficient, the vast bodies of water

at our command are sufficient to maintain under cultivation the whole of these large tracts, to call into existence a prosperous population, and to secure an abundant revenue to the State. But in the existing conditions of Indian finance, we cannot expect Government to incur the heavy annual expenditure involved in the maintenance of canal irrigation, if the revenue is so exhibited in the accounts as to represent incorrectly the extent to which the revenue depends on that irrigation. It is for this reason, and not by way of arbitration between the contending interests of different departments, that I understand the distinction of canal revenue and land revenue to have been introduced into the revenue accounts of the district of which I am now speaking. It is on this ground that, I think, it should be continued.

The distinction does not in these districts depend, as in the tracts watered by the sub-Hamalayan perennial canals, on the form of the assessment, on the agency by which it is assessed, or on a *quasi*-contract brought into existence and continuing over and above the land revenue assessment. It merely expresses the fact that the revenue assessed on the land depends on the canal irrigation supply. And seeing that this revenue will not be paid for a year longer than the canal irrigation continues to be efficient, I feel that I should incur some responsibility if I were to support any proposal by which this complete dependence of the major portion of our existing revenue in the south-west of the Punjab and of its future growth on canal irrigation would be obscured in the Government's accounts.

I. I am writing in camp without the opportunity of checking my data by reference to original sources. But speaking second hand from data found by me in the file, I believe that the Government has from time to time, under the influence of these considerations, sanctioned the following distributions of its income from lands in these districts under the respective heads of accounts concerned :—

Dera Ghazi Khan Settlement Report, paragraph 391.

(I).—If the land receives no assistance from canals, the whole assessment is credited to land revenue. This includes grazing assessments.

Muzaffargarh Settlement Report, paragraph 11, Chapter VII.
Mooltan Settlement Report, paragraph 255.

(II).—If the land is irrigated partly by wells and partly by canals, one-third of the assessment is credited to land revenue and two-thirds to canal revenue.

(III).—If the land is irrigated by canals and receives no assistance from wells, the whole assessment is credited to canal revenue.

If this distribution of the assessment in Government accounts errs at all, the error in my opinion, lies in this respect, that it exhibits as land revenue part of the assessments paid by well-irrigated lands, which are in fact really dependent on the canals. In most cases the wells would fall out of cultivation if the canal irrigation were to become inefficient. And I think that under the influence of experience gathered in tracts where wells are assisted by a sufficient rainfall we have not fully recognised in these rainless tracts the entire dependence even of the wells themselves (as profitable investments) on the assistance derived from the canals. The agriculturists speak very decisively on this point, and their experience appears to me to be indisputably correct. The more I know of these tracts the more the same conclusion forces itself on me.

9. I hope I have now explained sufficiently the difference between the system of assessment contemplated by the Canal Act and hitherto current in our sub-Himalayan districts and that actually hitherto applied in the rainless tracts of the South-West Punjab. It appears to me that in dealing with such cultivation as will be called into existence by the Sidhnai, Lower Sohag, and Chenab Canals, and by other similar canals in prospect, we have to choose between one or other of these two systems; and that in dealing with such an important question our choice cannot be too well considered, deliberate and distinct. It is not in our power to create a tenure from which the eventuality of a tenant's sub-tenure will be eliminated, and if the assessment due to canal irrigation be charged under Section 36 of the Canal Act, it will be payable from

the tenant and from the tenant's share of the produce. Its success will then depend on one or other of two results, neither of which can be predicated with certainty :—

(I).—That the holdings will be usually cultivated by the lessees or owners themselves, and that they will not entrust the cultivation to tenants.

(II).—That where tenants are put in by the owners the tenants will get at cash rents (a highly improbable result) or pay as rent a much lower share of the produce than is customary on lands hitherto irrigated by canals.

I do not think I should be justified in saying that either of these results can be reckoned on with certainty, and I should err greatly if I were to advise Government to adopt a form of assessment which would depend for its success on a radical readjustment of the terms on which owners and tenants have hitherto adjusted their mutual engagements in this part of the Punjab.

10. I know of one instance in which this assumption has been made, and it furnishes me with strong support for the reluctance that I have above expressed. I formed my opinion quite independently of this case, which has come under my examination since my proposals for the Sidhnai Canal were framed. The conditions of cultivation and the previous history of rents and revenue assessment in the tracts adjacent to the Sidhnai Canal and in the canal-irrigated villages of the Dípalpur tahsíl of the Montgomery district are nearly identical. In the canal villages of the Dípalpur tahsíl the cultivation has been called into existence by inundation canals, which supply sufficient water for the autumn crops, but leave the rabi crops (the first watering excepted) dependent on costly well irrigation. Up to 1873 the State's revenue demand was charged to the owners and paid by them from their rent (*mahsúl*) share, which share, allowing for all deductions, represented on a high estimate about a fourth of the gross produce. But, as in the Mooltan districts, the tenant is required to supply labour for canal clearances at an estimated cost of some 12 annas per acre irrigated; so in the *Dípalpur tahsíl* the tenant was charged a 8-anna water-rate. The tahsíl coming under *settlement about the year* 1870, the Canal Officers pressed for a much higher assessment of water-rate on the system in vogue on the Bári Doáb Canal, and of not dissimilar, though reduced, amount. The Land Revenue Officers at first resisted the proposals. And the Financial Commissioner (Sir Robert Egerton) instructed the Settlement Officers that the assessment should be made by one rate, variable according to the area and crop irrigated in each year; the gross receipts being divided for purposes of account between canal and land revenue after reaching the Government treasury. This proposal was approved by Government, and it was undoubtedly the intention of these orders to continue the previous system under which the owner was liable for the revenue so assessed. But the rates having been sanctioned under the names of water-rates, the Settlement Officers appear to have considered themselves bound to charge them to the occupiers, although the Settlement Commissioner himself urged that this change involved a complete abandonment of the system of assessment recommended under the Financial Commissioner's first instructions, and asked for an assurance that the owner's rents would not be subsequently charged with owner's rate. But at the time the Settlement Commissioner made this recommendation he was himself asked sanction to an assessment which taxed the owners of wells in the canal tract of this tahsíl with more than double the revenue paid by wells in adjacent tracts where there was no canal irrigation. And there is grave reason for thinking that, instead of the system contemplated by the Financial Commissioner's instructions, we have to a certain extent in this tahsíl charged, at one and the same time, the owner's with canal revenue on the Mooltan system, which assumes the receipt by the owner of a full canal rent from the tenant, and the tenants with water-rate on the sub-Himalayan peren-

Proceedings, Punjab Government, *A. R. C. Department* No. 10 of March 1873.

Paragraph 6 of Financial Commissioner's No. 5211, dated 17th August 1871, in above Proceedings.

Secretary, Government, Punjab, No. 340, dated 8th March 1873, in same Proceedings.

Paragraph 9 of Settlement Commissioner's No. 22 E., dated 22nd April 1873, at pages 52-3 of Appendix to Proceedings, Punjab Government, A. R. C. Department, for August 1873.

nial canal systems which assumes that the tenant will not pay such a rent. I append a copy of a letter recently addressed by me on the subject to the local authorities. It will be seen from it that this attempt to make an assessment in disregard of the pre-existing customary distribution of profits and charges between owner and tenant has in this case produced grave results, giving to the tenants a strong motive for seeking holdings where the relations which by long experience have been established between owner and tenant are not thus distributed, creating a necessity for reduction of rents to which the owners are able to respond in only a very limited and inadequate degree, and as a general result enfeebling the power of the owners to meet the bad years which occur occasionally on all inundation canals. I do not contend that the whole of this trouble has been caused by the novel method of assessment introduced in 1873, but the justice of the new canal assessments is denied in strong terms by the person affected by it on the ground that it places on the tenants a greater burden than they have previously borne, or can now bear, in addition to the expenses of holdings to which a well, strongly equipped with six pairs of oxen and six farm labourers, is essential for success. And I do not think there can be any doubt that the new form of assessment has materially aggravated the effects of failing canal-supply.

11. This case supplies evidence of the risks we run when we attempt to adjust the burdens of our assessment without reference to the customary distribution of charges between owner and tenant. If it is replied that this argument does not apply to new locations or to a case in which the owners will usually cultivate their own holdings, I would point out that tenants will expect the owners of these newly-irrigated lands to treat them with the consideration customary on adjacent holdings; and if not so treated, the steadily improving management of other canals in Mooltan, where the customary relations continue undisturbed, will give to the tenant's class both the motive and the opportunity to avoid holdings where they will be unfavorably situated. And, further, the attention which I have given to the subject during the past three months has convinced me that by no possible arrangements can we avoid the location on these lands of a large number of tenants over and above the lessees to whom we allot the lands and who will hold under the lessees. Where agriculture is supported by rainfall or by perennial flow irrigation, the conditions of husbandry are so simple that it is easy for the State to deal directly with the cultivator. No Government has ever succeeded in doing so in the Mooltan district or in districts similarly circumstanced. The existing customary division of the produce between rakhán, mahsúl and lich, with the additional allowances of anwandha and kasúr, are as old as the history of the country, and they evidence the conditions essential to the success of its agriculture. There must be provided to each holding a well which with its wood-work will cost from Rs. 400 to Rs. 600. There must be at least six yoke of oxen, which will cost at least another Rs. 300, and to work them on the well and on the land there must be at least five or six men. Assume for the agreement that the lessee's family supply two men: on a strong holding there must be three or four more men. Assume, if we choose, that the owner or lessee is a prosperous man and decides to take on himself the entire expenses of cultivation, he must still have these men, and what such an assumption really imports is that these men shall be mere farm labourers. It is much better that they should not be in this position, but sit as tenants owning and caring for their own oxen, and taking the full share in the expense and produce of the holding as fixed by past experience and established usage. It is true that the tenants commonly receive advances from their owners, which represent the value of the well cattle, but extra hands over and above those of the owners there must be, and it is better that the extra hands should be tenants than mere farm servants. I do not share the common belief in the thriftlessness of these tenants. They have had immense difficulties to contend with in past years on account of the uncertainties of canal irrigation against which they bear up bravely. And the varieties of contract, or rather usage, between this class and the owners are so considerable that it is often difficult to say where tenancy merges into farm labour and *vice*

Rakhan=The cultivator's share of the produce.
Mahsúl=The revenue share due to the State.
Lich, anwandha, kasúr, &c.=The allowances made by both State and cultivator to the person who has put in the cultivator, who provides his well, and helps him to provide the well-cattle.

versa. But as a class they are inseparable from the agriculture of the canal tracts of the South-West Punjab. I think this part of the case has so far not been fully appreciated. We can succeed in our desire to give out the land in small holdings of 100 acres or so, and I think it better to do this, if possible, than to assign large grants to capitalists and other persons who are not of the agricultural class, nor in full sympathy with them; but we cannot eliminate the condition of tenancy even from these small holdings, and if we were by chance to succeed in doing so, we should merely have created in the place of tenants a class of farm servants of very inferior position, independence and thrift.

12. From the whole of the above argument it will be understood that I do not feel able to advise Government to extend the system of assessment expressed in the Canal Act of 1873 to the rainless districts of the Punjab, in which our new canals will be constructed and where agriculture has no existence except so far as it is supported by such canals. In these tracts the occupier is, by existing customary relations, charged with the expenses of working the well, which is a necessary adjunct to canals which flow only in the hot season. Whether the customary share of the produce retained by the occupier or tenant in return for these services is capable of reduction is a question of a very speculative character, which it is best to leave for adjustment between the owner and his tenants. The maintenance of canals is a function hitherto discharged by the State with the assistance of the cultivator's labour. As we are giving up on the Sidhnai and other new canals any claim for such labour contributions, it is safe and practicable to demand a revenue higher than has yet been levied on adjacent canals. But it is not safe to shift the State's revenue demand from the person who will receive the mahsúl (revenue) share, now described as rent, to the occupier who retains only the cultivator's share and has to meet from this share the heavy current expenses of a fully equipped well. Nor in my opinion can we properly ignore the hitherto universally accepted interpretation of Section 36 of the Canal Act, whereby a water-rate assessed under that section is in all cases of tenancy levied from the tenant and not from the owner.

13. Similarly I do not think it would be right to avoid dealing with the difficulties of assessment which I have been discussing by charging the lessees with rent rates in lieu of revenue. Such rents would not be recoverable as revenue under Section 63 of the Land Revenue Act. They would be simply rents due under contract to be enforced in the same manner as all other ordinary contracts. Substantially and really we are making an assessment of revenue; and it is incumbent on us to make it in accordance with the provisions either of the Land Revenue Act or the Canal Act.

14. I pass on to another question, that of seignorage, in respect of which the proposals under consideration cause me grave anxiety; and I do not think the circumstance that the new rules for the lease of waste lands recently sanctioned by Government require the assessment of malikana (seignorage) at one-fourth of the revenue payable discharges me from the responsibility of pointing out that the rule is not suitable to the case under discussion if literally applied. The liberal application contemplated I understand to be as follows.

Punjab Government (Revenue and Agriculture Department) Resolution No. 1179S., dated 3rd September 1885, paragraph 10.

The fluctuating rates of revenue which it is contemplated to apply are assumed as likely to yield an average annual revenue of about Rs. 110 per holding (the cultivated area assumed being 45 acres). The rule adding one-fourth as malikana would give an average addition of Rs. 27 on this account; but it is considered a sufficient concession to charge only Rs. 20, which on the average cultivated area assumed equals a malikana rate of over 7 annas per acre.

My first reply to this calculation is, that it overlooks the distinctions which exist between the two methods of revenue assessment which prevail in the Punjab on canal-irrigated lands, and which I have explained in the former portion of this note. Speaking under correction, it appears to me that the rule was framed with reference to a condition of affairs under which water-

rate (which is not revenue in the sense in which this term is used in the waste land rules) is charged to the occupier, such water-rate being excluded from the revenue on which the seignorage is reckoned. On the Sub-Himalayan canals the water-rate stands to the owner's rate sometimes in the proportion of 2 to 1, and sometimes in a higher ratio. I therefore contend that a literal application of the malikana rule in this case is out of place; and that to apply it with justice the average revenue of a holding should be assumed as below Rs. 50; and that therefore the malikana should not exceed Rs. 12 per holding.

15. But even this contention does not satisfy me as meeting adequately and justly the merits of the case. In its application to holdings such as those of the Sidhnai Canals, the present malikana rule appears to me to be essentially unsound. *Quâ* the Malikana charge, the lessees are to be treated as if they were not owners; *quâ* all the responsibilities and expenses of ownership, they are to be treated as if they were owners. They are to clear the land, sink wells, establish successful agriculture, and pay an average revenue charge which on the greater portion of their holding will exceed (cesses included) Rs. 2½ per acre of crops. In so far as current charges and responsibilities are concerned, their position will not differ from that of full ownership. It is not just under such circumtances to subject them to malikana charges of an amount and character such as owners do not ordinarily pay, though at the same time it may be, and I think is, perfectly fair to withhold any definite grant of ownership until the holding has been fully established, and pending that result to require the payment of a small fee in acknowledgment of the inchoate character of the tenure. Seeing also that the value of the holding is created rather by the Government's canal than by the owner's well and other efforts, it is also fair and just to require of the lessee the payment of a substantial sum before granting him full ownership.

16. For these reasons I adhere definitely to my original proposal in respect of malikana, and desire to press them on Government. The malikana charge should not exceed Rs. 5 per holding per annum; or, if so preferred, it may be stated at one anna per rupee of rupee actually paid. I deprecate strongly its enhancement above this rate, partly because we should thereby overcharge the settlers when their expenses are heaviest on them, and partly because the effect of stating the malikana higher will probably be to lower the permanent revenue rates of the canal. The revenue rates as originally stated were intended to express the revenue fairly chargeable to all holders, whether lessees or full owners. If they are overstated they should be reduced; but they should not be reduced in order to produce an arbitrary adjustment between revenue and malikana. And on the other hand, a lessee who at the beginning of his tenure has to meet all and more than all the ordinary responsibilities of ownership should be allowed to get at the rates which an owner would pay. He has an owner's expenses, and he needs an owner's profits if he is to be otherwise than unthrifty.

17. As to the rates which it is suitable to assess, and as to the manner of assessing them, I adhere generally to my previous proposals, which are in accordance with those which Sir Robert Egerton intended to apply (though the proposals miscarried in execution) to the Dípalpur Canal villages as explained by me in paragraph 10 above, They are—

	Rate per acre. Rs.	A.	P.
On Kharíf crops irrigated by the canal	2	8	0
On rabi crops ditto	2	4	0
On crops not assisted by canal irrigation	0	12	0

subject to the following deductions and additions, *viz.*—

Additions—local rate at 2 annas, and village servants' and zaildárs' fees at 2 annas per rupee of revenue.

Deductions—(*i*) one-fifth of all charges for 5 years ending rabi A.D. 1890; (*ii*) one-third of the rabi irrigated rate on all crops irrigated by both canal and well for 20 years from date of sinking the well.

These proposals are really the same as those previously submitted by me, except that I have eliminated the words "canal revenue" and "land revenue," leaving this distinction to be dealt with in the treasury accounts, when the gross collections are credited, in accordance with any orders which Government may issue.

The allowance to new wells is based on my original proposal which treated two-thirds of the rabi rate as canal revenue, and it will protect the well-owner to the extent sanctioned by the standing orders.

18. I do not recommend that the cesses be consolidated with the revenue rates. The system, which we have recently given up, under which the cesses were enumerated, reckoned and entered in the village accounts and treasury accounts under seven or eight different heads, was indefensible. But it is the system of the Province to surcharge upon the revenue the contributions due to village servants and to local rates, and in the concise form above proposed (which agrees with the District Boards Act and with the Draft Land Revenue Bill) no inconvenience is caused by this practice, while the system expresses a sound principle which is likely to prove hereafter of increasing importance, *viz.*, that the contribution to the state's revenue shall not be confounded with the charges necessitated by local services and local wants.

Circular No. XIV of 1881, paragraph 2.

19. I further attach weight and importance to my proposals that when a previously-settled village applies for irrigation from the Sidhnai Canal, the lands to be so irrigated shall be marked off, the assessment previously paid by those lands shall be remitted, and the Sidhnai rates thereafter be charged. I adhere to this proposal, because, on the assumption that the Sidhnai rates are fair, this relief is essential to their just application to lands previously settled. And I have other reasons for adhering to it. Between a half and a third of the lands commanded by the Sidhnai Canal are included in the bounds of villages previously settled. These villages, though assessed lightly, are not in a prosperous condition. They will be still more unprosperous if they are required to pay both their previous assessment and the new rates. Moreover, the tenants of these villages will be under great temptation to go to the newly settled land, and the mere fact that these lands are advantaged in assessment would decide their choice. It would import to them the distinction between serving under a heavily assessed owner and a fairly assessed owner. For all these reasons I think it most inexpedient, as it would probably be unjust, to maintain the old assessment and demand the new rates in addition.

20. Nor, on a full consideration of the subject, can I recommend the addition of a one-anna or even half-anna per acre grazing rate on these holdings. I know no tract in which this charge has been assessed in which it does not form the subject of complaint. From Gugaira, Montgomery, Pákpattan, Dipálpur, Fázilka, I hear the same complaint; it is paid, but not from the income of the waste. The complaint is true. Ordinarily there is no grazing worth speaking of on this waste. And by ancient and universal custom an agriculturist has always had the free use of a limited area of waste adjacent to his cultivation.

21. As regards the share of the revenue assessed and collected which should be treated as land revenue, there are some items in respect of which there can be no difference of opinion. (*a*) There will always be a small amount of cultivation unaided by canal irrigation; (*b*) the grazing revenue (tirni) will shrink in proportion to the extension of cultivation supported by canals; (*c*) the present assessment of old villages which accept irrigation from the Sidhnai Canal will be reduced in proportion to the area so treated. The first item (*a*) will be known from year to year. The second and third items can be ascertained and certified from year to year. The arrangements that may be considered suitable for the exhibition of these items in the accounts is a matter for adjustment in the Account Department. But if it is desired to go further than this, and to exhibit in the accounts as land revenue income not now existing, and which will come into existence only in consequence of the construction and efficient maintenance of the canal, I think it my duty to say that such a decision is likely to misrepresent in a serious degree the real foundation of this income. The practice of reckoning as land revenue income which depends for its existence on irrigation has done more to hinder the development and prosperity of the

rainless regions of the Punjab than the sum total of all mistakes and shortcomings which have yet occurred in their administration. It is to this that we owe whatever unwillingness the Government have felt to supply funds for the efficient administration of the Indus, Chenab and Sutlej Canal systems; it has crippled and still cripples the Irrigation Officers of these systems at every step; it has given rise to and supported the assumption that in a rainless country where agriculture (apart from the mere edges of the river) depends for its very existence on canal irrigation, such irrigation will not yield a fair return on its capital cost; it deprived the canals of the Muzaffargarh District of all skilled control for the first 30 years of our rule; and at the present moment it has brought more than half of the Montgomery district to the edge of severe distress; it has cost the people untold trouble and wealth; it has checked their confidence in our administration; and it has stunted the growth of the State's revenue.

I do not desire that the difficulties or obstacles that may be in Government's way in dealing with this principle should be overlooked or under-rated. I am sensible that I may not be in a position fully to appreciate them, nor does it fall to me to deal with them. But it does lie with me to represent adequately the injuries which we have suffered in the past, and the dangers we incur in the future, from any system which tends towards obscuring in the Government's accounts the extent to which agriculture has been created by, and is dependent on, irrigation systems—dependent alike for their creation and maintenance on a large and liberal expenditure.

22. It remains to notice some minor points connected with the case.

(I).—Consultation with the First Financial Commissioner directed that the land be surveyed in squares of 180 kadams each, thereby reducing the size of the square to 22·5 acres, and the holding to 90 acres. The reduction is convenient for several minor reasons into which I need not enter. I do not think that with reference to local conditions of agriculture and the requirements of husbandry, which is partly dependent on irrigation from wells, the holding unit can be safely reduced below 90 acres.

(II).—I have recast annexure B of my previous note in verbal consultation with the Government Advocate, reducing its contents to—

(*i*) a form of application for land; with

(*ii*) conditions appended to which the applicant in his application assents.

It will still be necessary to refer this paper to the Government Advocate for detailed examination.

(III).—This new draft of Annexure B contains (besides alterations of language) two important modifications relating to irrigation arrangements. In the first place, it leaves the applicants to apply for a water-course to the Canal Officer under Section 16 of the Canal Act. That section provides for such applications and for the recovery of the cost of water-courses constructed pursuant to such applications. The proper maintenance of such water-courses is provided for by Section 19 of the Act; and improper alienations of water will be prevented by the terms of Section 32 (*d* and *e*). In the next place, the liability to supply labour is made a condition of the grant of the land. After verbally consulting the Government Advocate, and on further consideration of the terms of Section 32 of the Canal Act, this appears to be the only course open to us in the existing state of the law.

See paragraph 12 of my Note, dated 4th December 1885.

(IV).—I have accepted the suggestion that zaildárs be paid not by an allotment of land but by a cash rate. The amount provided for lambardárs and patwáris in the rates proposed by me is 2 annas per rupee, or 12½ per cent. of the revenue. Of this 6¼ per cent. will go to patwáris, and of the remaining 6¼ the lambardár can take 5 per cent. and the zaildár 1¼.

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No. 810, dated Lahore, 3rd November 1885.

From—R. G. Thomson, Esquire, Junior Secretary to Government, Punjab,
To—The Secretary to the Government of India, Revenue and Agriculture Department.

Government of India (Public Works Department, Irrigation), No. 72 I. of 29th February 1884, to Punjab Government (Public Works Department, Irrigation).

I am directed by the Lieutenant-Governor to draw attention to the letter noted on the margin, and with reference thereto and to the other correspondence on the same subject with the Government of India in the Public Works Department, I am to say that the Sidhnai Canal in the Mooltan District is now practically complete and capable of giving immediate irrigation over a considerable area.

2. As the Government of India is no doubt aware, the lands which will be irrigated from this canal are largely made up of waste areas, the property of Government, which are at present mainly used as pasture lands and little, if at all, inhabited. These lands have to be colonized; and as the population of Mooltan is somewhat sparse and mainly made up of indolent or inefficient races, it is proposed, as far as may be found possible, to seek for colonists among the sturdier population of the Central Punjab, and to settle them under leaders of their own in complete village communities of cultivating yeomen lessees, who will gradually grow into proprietors.

3. The lands upon which these new cultivators will be settled are at present divided into rough blocks of country; but otherwise they have never been thoroughly mapped, nor, from the nature of the case, has any sufficient record of rights been framed. It will now be necessary to break up the blocks and to redistribute them in village areas, to map the various allotments, and to draw up a sufficient record of the rights and duties of the new lessees. These duties have been taken up by the Second Financial Commissioner (Colonel Wace) with the assistance of a specially selected officer. It has also been found necessary for purposes of record and survey to engage the services of a small temporary establishment. As to this I am to enclose, for the information of the Government of India, a copy of the 17th paragraph of a memorandum by Colonel Wace upon the colonization of these waste lands. It will be seen that Colonel Wace estimates the cost of this establishment (inclusive of contingencies) at Rs. 7,000 per annum, and he asks that charges up to that amount may be accepted against corresponding savings in the Settlement Budget grant. The details of the establishment to be employed would be left to the discretion of the Financial Commissioner only, subject to the cash limit of Rs. 7,000 per annum.

4. The Lieutenant-Governor considers that there can be no doubt of the necessity of this expenditure, both to permit of the proper colonization of these waste lands and to allow the irrigating capacities of the new canal to be utilized as soon as possible. The area of Government waste land to be dealt with is 118,000 acres, of which about 41,000 acres will receive canal irrigation. It is hoped that operations will either be concluded within a year or so far organized as to be safely entrusted to the management of the ordinary district staff. I am therefore to ask the sanction of the Government of India to expend the sum of Rs. 7,000 partly in this and partly in the next financial year, on the temporary establishment and contingencies required in connexion with the settlement of the Sidhnai lands in Mooltan. The sum of Rs. 7,000 will be provided by an equivalent saving on the sanctioned Settlement Budget grant.

5. I am to request the favor of an early reply to this reference; pending the sanction of the Government of India, the Accountant-General has been desired to accept bills for the Sidhnai Settlement up to a limit of Rs 7,000.

Telegram, dated 14th December 1885.

From—Lahore,	To—Calcutta.
From—Punjab Secretary.	To—Govt. of India, Rev. and Argl. Dept.

No. 541. To utilize water of Sidhnai Canal for next kharíf it is absolutely necessary to dig minor channels. Canal officers will do work. Cost one lakh ten thousand. Must be completed by 1st April next, and every day of import-

ance. Lieutenant-Governor is providing the money from takkávi balance and trusts Government of India will approve. Without it settlers cannot be located or canal water utilized.

Telegram, dated 15th December 1885.

From—Lahore, From—Punjab Secretary.	To—Mooltan. To—Deputy Commissioner.

No. 546. Pending further instructions, which will issue shortly, you can advance money up to a reasonable amount to Irrigation Department for Sidhnai minors.

Telegram, dated 19th December 1885.

From—Calcutta, From—Govt. of India, Rev. and Agrl. Dept.,	To—Lahore, To—Punjab Secretary.

No. 850. Your telegram 541 of 14th. Government of India is willing that digging minor channels to utilize water of Sidhnai Canal should continue, but desires full explanation at once by letter as to provision of funds.

No. 82, dated Lahore, 24th December 1885.

From—R. G. Thomson, Esquire, Offg. Junior Secretary to Government, Punjab,
To—The Secretary to the Government of India, Revenue and Agricultural Department.

In reply to your telegram No. 850 of 19th December 1885, I am directed by the Lieutenant-Governor to say that the Sidhnai Canal, with its rájbahás or major distributaries, is now complete and ready to irrigate as soon as the river rises in May or June next. But its capacities cannot be utilized without minor water-courses to lead the water from the rájbahás into the various village areas. In ordinary circumstances these minor channels would have been dug by the irrigators themselves (with or without takkávi), or they would have been constructed by the Irrigation Department under the procedure described in Part III of the Canal Act (No. VIII of 1873). But, as the country to be irrigated is not yet settled, it would have been impossible to adopt either of these plans in the present instance without incurring the almost certain risk of a loss of the whole or most of the irrigation proceeds of the coming kharíf harvest. Under these circumstances the Financial Commissioner proposed to make over to the Irrigation Department the available balance of the Takkávi allotment of the Mooltan district for advances under Act XX of 1883 during the present year. This balance is about one lakh of rupees more or less, and with this sum the Irrigation Department undertook to complete the whole system of minors by April next upon a single and rational plan. The money thus expended would be considered as takkávi, and, under agreement, gradually recovered in about 12 or 15 years from the cultivators on the new canal who would enjoy the benefit of the water-courses.

2. The Lieutenant-Governor accepted this plan as being the best possible in the interests of all concerned. It does not require any fresh grant for expenditure, nor does it appear to involve any violation of the spirit or substance of Act XX of 1883. But it is undoubtedly a formal violation of the Rules under that Act to advance money to the Irrigation Department to be spent on village water-courses and afterwards recovered from various persons not yet perfectly ascertained. Before therefore giving his full sanction to the arrangement, the Lieutenant-Governor desires to obtain the approval of the Government of India, which I am to request may be given at a very early date. Meanwhile, the Lieutenant-Governor, in order to prevent loss of time where the time is hardly long enough for what has to be done, will authorize a moderate expenditure from takkávi funds on the objects and under the arrangement described. The Government of India will see that the whole sum to be advanced will be recovered with interest in the ordinary way; the only difference being in the manner in which the money is advanced and spent and in the agreements under which it will be recovered.

No. 773, dated Calcutta, 17th February 1886.

From—J. E. O'Conor, Esquire, Asst. Secretary to the Government of India, Department of Finance and Commerce,
To—The Secretary to Government, Punjab.

I am directed to acknowledge receipt of your letters Nos. 810 and 82, dated the 23rd November 1885 and the 24th December 1885, respectively, to the Revenue and Agricultural Department, regarding the provision of funds for the construction of minor water-courses required in connection with the Sidhnai Canal.

2. It is proposed to make over to the Irrigation Department for the purpose the available balance of about one lakh of rupees of the takkávi allotment of the Mooltan district during the current year, and to recover the amount expended from the cultivators interested in the water-courses.

3. In reply I am directed to state that as the time of recovery of the proposed advance from the cultivators is indefinite, it is, in the opinion of the Hon'ble the President in Council, preferable to charge off the sums required for the project during the current year and 1886-87, to expenditure rather than to treat them as advances to be recovered hereafter.

4. I am accordingly to state that the sums of Rs. 15,000 and Rs. 1,05,000, estimated in your telegram of the 25th January 1886, to be required for the two years respectively, will be added to the grants for 1885-86 and the following year under head "44—Irrigation and Navigation." This procedure need not interfere with the recovery of the amounts from the cultivators in future years.

No. 22, dated Lahore, 19th March 1886.

From—R. G. Thomson, Esquire, Offg. Junior Secretary to Government, Punjab,
To—The Senior Secretary to Financial Commissioner, Punjab.

With reference to previous demi-official correspondence as to the construction of main village water-courses (formerly called Minors) on the Sidhnai Canal in the Mooltan district, I am directed to forward for information and guidance a copy of the correspondence noted on the margin as to the provision of funds for the above works.

1. This office No. 82 of 24th December 1885.
2. Government of India's No. 773 of 17th February 1886.

2. It will be seen that this Government recommended that the balance of the takkávi allotment of the Mooltan district for 1885-86 should be made over to the Irrigation Department for the construction of the water-courses, and should afterwards be recovered from the cultivators on the new canal in rateable shares as though it were an ordinary takkávi advance. The Government of India has, however, ruled that the expenditure for the construction of these water-courses must be charged under "Irrigation and Navigation," but nevertheless recovered hereafter from the cultivators.

3. Any amount which the Deputy Commissioner of Mooltan, in accordance with telegraphic permission from this office, may have already advanced to the Irrigation Department out of takkávi funds should now be recovered, and no more similar advances should be made. The Irrigation Department will itself supply the funds for the construction of the water-courses. But as the funds thus expended are to be recovered from the cultivators, it will be necessary for the Financial Commissioner to see that proper arrangements are made to keep the Deputy Commissioner informed of the sums to be recovered; and, further, to give such instructions as may be necessary for their proper recovery and credit to the Irrigation Department. All recoveries should be made through the Deputy Commissioner with interest at the ordinary takkávi rate. It is understood that rateable shares will be recovered from all cultivators benefiting from the water-courses whether in Government waste or village lands.

4. I am to add that the amount of the grants for 1885-86 and 1886-87 now sanctioned by the Government of India was fixed in accordance with a telegram from the Punjab Irrigation Department.

No. 23.

Copy of above and of its enclosures forwarded to Irrigation Department for information and guidance.

No. 24.

Copy of above and of its enclosures forwarded to Accountant-General, Punjab, for information and guidance.

No. 25, dated Lahore, 20th March 1886.

From—R. G. Thomson, Esquire, Offg. Junior Secretary to Government, Punjab,

To—The Secretary to the Government of India, Revenue and Agricultural Department.

In continuation of my letter No. 82, of 24th December last, I am directed by the Lieutenant-Governor to submit, for the orders of the Government of India, an account of the method which it is proposed to adopt for the settlement of the lands about to be irrigated from the Sidhnai Canal in the Mooltan district.

2. The process of settling an agricultural population upon waste land hitherto uninhabited, and which cannot be cultivated without artificial irrigation, is both difficult and peculiar. In some respects it is analogous to the foundation of a colony; and it is of course essentially different from the ordinary leases of detached blocks of Government land to casual applicants under the standing rules. The Financial Commissioner, therefore, considered it impossible to deal with the case of these Sidhnai lands as a mere aggregation of applications for leases of the usual type, and he proposed to treat the whole subject consistently and in its entirety under special arrangements of its own. In these views the Lieutenant-Governor concurred.

3. It has been ascertained from the Irrigation Department that, owing to the construction of a weir across the river, the area commanded by the Sidhnai Canal is now 256,000 acres, out of which it is expected that 64,000 acres will be actually irrigated. About one-third of the area commanded and to be irrigated is within village boundaries, and the remaining two-thirds are Government waste lands. The arrangements to be made in village areas which will now receive canal water will be dealt with hereafter; at present we are only concerned with the settlement of the Government land.

4. The water of the Sidhnai is distributed primarily by rájbahas, of which the irrigating capacity varies from 6,000 to 34,000 acres. From these proceed the main village water-courses with an average length of two miles and a command of the country to a distance of one mile on either bank. Thus each water-course roughly commands an area of about 2,500 acres, and this it is proposed to take as the unit for the future village. Each village will thus be self-contained, of a convenient size, and entitled to the sole use of its own water-course without interference from outside.

5. Within each village area the land will be surveyed in square blocks, each side of the square being 180 "kadams" of $5\frac{1}{2}$ feet English. Each square will thus be 22·5 acres. Four of these squares, or 90 acres, will be the usual unit of grant to each applicant. The size of this unit has been fixed on a consideration of all the circumstances of the case. On the one hand, it has been held desirable to maintain the tradition of the Punjab as a country of small cultivating proprietors, and to discourage the formation of large properties worked by rent-paying tenants. On the other hand, it must be remembered that each holding will probably in course of time be sub-divided. Even at present an area of 90 acres, of which about a third will be canal-irrigated in each year, does not appear too much for the energies of a single peasant family. In a rainless country like Mooltan cultivation, even on the small scale, requires an unusual amount of hired assistance. It is therefore desirable to have the holdings rather larger than usual. Further, with an inundation canal like the Sidhnai, cultivation for the rabi harvest, although practically impossible without canal water, cannot be carried to perfection as a general rule without the assistance of well irrigation also. It is very desirable therefore that each holding should be equipped with a well solely devoted to its own service. But a well fully furnished with cattle is very expensive, and the inducements to construct it would probably prove insufficient in many cases if the holding were less than 90 acres. For these reasons the Lieutenant-Governor has fixed this area as the ordinary unit of grant, reserving power to increase or diminish it in individual cases as may seem desirable.

6. A record of rights will be prepared for each mauza, or collection of holdings, in the ordinary way. It was originally intended to prefix to this record a statement of the conditions upon which the holdings would be leased, together with a clause stating that they were understood and accepted. This would have been signed or sealed by all the applicants for holdings whose title-deeds would then have consisted merely in a copy of this statement and of an extract from the record of rights. In the present state of the law, however, the Lieutenant-Governor was advised not to adopt this course, and accordingly it has been decided to issue a regular deed of lease in regard to each holding. A form of deed has been prepared by the Government Advocate under instructions from this office, and of this a copy is submitted herewith. It will be seen that to some extent it departs from the conditions usual in such documents; and in connection with these innovations I am to invite attention to the following remarks.

7. On the Inundation Canals of the Mooltan district canal water is not charged for separately by a distinct occupier's rate, nor are owner's rates levied. The whole charge for water-rates of all kinds is lumped with the ordinary charge for land revenue, and levied from the villages as a single item under the name of land revenue. The amount collected is then distributed in account between "Land Revenue" and "Irrigation" according to certain definite rules. This system is both convenient in itself and well understood by the people. The special reasons which render it particularly desirable to maintain it in the present instance are explained in paragraph 15 of this letter.

The Lieutenant-Governor has, however, been advised that it is legally incompetent for Government to manage its canals otherwise than under the provisions of Act VIII of 1873. The validity of this opinion may perhaps be doubtful in view of the numerous existing instances of contrary practice in the Punjab; but in order to save the necessity for a useless enquiry, the Lieutenant-Governor has resolved, in the first place, to maintain the regular Mooltan system of one gross payment inclusive of all charges for land and water revenue; and, in the second place, to meet the assumed requirements of the law by an acceptance by Government of responsibility for all charges for rates leviable under Act VIII of 1873. It is in accordance with this arrangement that Clause VIII has, under the advice of the Government Advocate, been inserted in the draft lease.

8. This being premised, the other conditions of the deed can be dealt with more shortly. It will be seen that the holdings are to be given out on lease with the option of purchase at any time after five years. Power to purchase has been purposely delayed with a view to allow the lessees to concentrate all their resources on the work of bringing the land thoroughly under cultivation. So long as the lease remains in force its terms are to be subject to amendment at the discretion of Government at each settlement of the Mooltan district, and a more liberal power has been reserved to alter rent rates which may appear unsuitable. This power would not be used for enhancements until the expiration of the period for which the current assessments in Mooltan have been sanctioned. At the instance of the Irrigation Department also a clause (No. XII) has been inserted, binding the lessee to furnish labourers for canal repairs and clearances in proportion to the amount of land which he has under cultivation. Such a clause is in strict accordance with the old existing custom of the Mooltan district, under what is commonly known as the *cher* system. It will be observed, however, that in the present case it is proposed to pay all the labourers called out. This is to some extent an innovation, as the obligation to furnish a certain amount of *unpaid* labour is one of the conditions of settlement in the old Mooltan canal villages.

9. The only other matter which requires attention is rent. As usual in similar cases, this is to take the form of land revenue plus a certain amount for

malikana. In view of the uncertainties connected with the establishment of agriculture in a new tract; in view also of the peculiar circumstances of the Mooltan district, where crops are almost entirely dependent on the somewhat variable water-supply in inundation canals, the Financial Commissioner has proposed to levy land revenue in the present instance by acreage rates applied to the crops successfully gathered at each harvest. This proposal has been accepted in principal by the Lieutenant-Governor; but, in order to avoid possible disputes as to whether crops have been successfully harvested or not, it has been deemed advisable to state the rates as rates on areas irrigated or cultivated rather than on areas from which a crop is gathered in. It is not intended, however, that the full rates should be taken in cases where crops fail wholly or partially from causes beyond the cultivator's control. Full power of remission has been reserved to the Deputy Commissioner, and it is intended that this power shall be freely exercised in case of failure in canal water-supply or other calamity of season which leads to the ruin or serious injury of the harvest on any particular area.

10. A system of this nature will require very careful annual measurements and inspections. But the Financial Commissioner will be able to arrange for these on the system now applied to the rest of the Mooltan district under the new Patwári and Kanúngo Rules. As the rates will only be levied in full from successful crops, it has been possible to fix them higher than would otherwise have been safe. At present it is proposed to dispense with differential crop rates, and to have one rate for all areas caanl-irrigated for the rabi, a second rate for all areas canal-irrigated for the kharíf, and a third rate for all areas cropped without any assistance from the canal. This last rate will apply to a comparatively small area. The rates proposed are Rs. 2-4, Rs. 2-8, and Rs. 0-12; and there will be certain minor and temporary reductions from these with a view to secure the encouragement of new cultivators and the usual protection during a term against enhanced assessments on new wells.

11. In the interests of simplicity all cesses have been lumped together in the lease at 4 annas per rupee of leviable assessment. Half of this amount will be devoted to village services—Zaildárs, Lambardárs and Patwárís, while the remainder will be credited as local rate.

12. The málikána has been fixed at Rs. 10 per holding of the average size. It must be remembered that about one-third of the irrigation from the Sidhnai will be given on village lands where málikána cannot be charged. It is not desirable to have different revenue rates for irrigated lands according as they are Government waste or village lands; and it is therefore necessary to fix the single scale of rates with a view to what can fairly be charged when no additional payment is demanded as málikána. In such circumstances the málikána itself must necessarily be moderate if the tenant of the holding is not to be overburdened. Colonel Wace, the Second Financial Commissioner, recommended a málikána of Rs. 5 only per holding; but the adoption of this proposal would practically take from the tenant all inducement to purchase his holding, and it therefore appears better to fix the málikána at Rs. 10, and this rate has the concurrence of the Senior Financial Commissioner, being indeed less than he himself suggested.

13. The rate of málikána adopted practically regulates the price to be paid by the lessee for the purchase of his holding; for the chief pecuniary result of the purchase is the redemption of the málikána charge. The price fixed by the Lieutenant-Governor is Rs. 3 per acre. This may appear a low rate; but it must be remembered that it will be paid in respect of the whole holding, of which not more than half will in all probability be cultivated in any one year at one time: and as Rs. 270 represents more than 25 years' purchase of the málikána, it is clear that no higher sum can be properly demanded.

14. In regard to the irrigation to be given upon village lands, it is proposed as a condition of the introduction of canal water to set aside the existing assessments of those villages so far as the land to be irrigated is concerned, which, with the exception of the málikána charge, would be assessed harvest by harvest at the revenue rates used on the Government waste lands.

15. The only question still remaining for consideration is the proportion in which the assessment of these irrigated lands, whether Government or village areas, is to be divided in accounts between the Irrigation and the Land Revenue Departments. The Lieutenant-Governor is aware that the Sidhnai will furnish a supply of water far more constant than can be secured on an inundation canal of the ordinary type. If therefore the country which it is designed to irrigate had been well populated and developed, it might have been possible, notwithstanding the established contrary custom of Mooltan, to apply with advantage the system in force on most perennial canals under which the irrigation revenue is separately assessed as occupier's or owner's rate. But it is necessary in the present instance to build up from the very rudiments, to settle a population, to attract cultivators, to provide for the foundation and management of villages, to organize and pay the ordinary rural agency, and in fine, to establish the whole economy of a new society. It is therefore impossible at the outset to make the distinctions in assessments between canal and land revenue which might otherwise have been proper on the Sidhnai. We must for the present resort to temporary arrangements of a different kind; and without thinking it necessary to discuss the principles upon which canal and land revenue should be discriminated—more especially as these principles have acquired a different value since Provincial Governments were given a share in the land revenue—the Lieutenant-Governor proposes in the present case to keep, as a temporary arrangement, to the customary system of one gross payment, out of which there would be credited as land revenue such surplus as might remain after providing for the canal a clear and invariable profit of 5 per cent. on capital in addition to all maintenance charges.

16. The estimated capital account of the project is $7\frac{3}{4}$ lakhs of rupees. Five per cent. upon this amount is Rs. 38,750 per annum. The estimated area to be irrigated is 64,000 acres; and at the rate adopted in the project of 12 annas per acre irrigated, which the Lieutenant-Governor considers a very high estimate, the annual cost of canal maintenance will be Rs. 48,000. Thus the annual income required to maintain the canal and to return 5 per cent. upon capital is Rs. 86,750. Now, a rate of Rs. 1-6 per acre irrigated upon 64,000 acres will yield Rs. 88,000, or rather more than sufficient. It must be remembered too that some ground may be double cropped, and that the whole capital of the canal is still far from expended, the estimated expenditure to the close of the present financial year being about $5\frac{1}{2}$ lakhs. On the other hand, something must be allowed for the gradual spread of irrigation, and the Lieutenant-Governor is therefore disposed to raise the canal rate to Rs. 1-8 per acre irrigated. I am therefore to propose that from all sums realized as revenue assessment from the lands, whether village or Government waste irrigated from the Sidhnai Canal, a sum of Rs. 1-8 per acre per harvest net be credited to irrigation, any surplus thereafter remaining being taken as land revenue. When the settlement of the Mooltan district has expired, and the cultivation on the Sidhnai Canals is throughly established, these arrangements can, if necessary, be reconsidered.

17. I am to request the favour of very early sanction to these proposals, which have been framed in communication with the Financial Commissioner and the Irrigation Department, and an intimation thereof by telegraph, in order that the settlement of cultivations on the canal lands may be proceeded with without delay. I am to say that the Lieutenant-Governor understands that registration of the proposed leases will not be necessary.

INDENTURE.

THIS INDENTURE made the day of 188 between the Secretary of State for India in Council (hereinafter called "the Government") of the one part and *A. B.*, son of C. D., caste resident of (hereinafter called "the lessee") of the other part: WHEREAS the new "Sidhnai" Canal [in the Mooltan District] is now ready to irrigate certain lands the property of Government in the district of Mooltan: AND WHEREAS the Government has at its own expense excavated certain channels adjacent to the said canal capable of being used for water-courses to be supplied with water from the said canal: AND WHEREAS the lessee, being desirous of

obtaining a lease of a portion of the said lands the property of Government situated in the vicinity of one of the said channels, has applied to the Government accordingly: Now THIS INDENTURE WITNESSETH that, in consideration of the rent hereinafter reserved and the stipulations hereinafter contained and to be observed by the said *A. B.*, the Government doth hereby grant unto the said *A. B.*, a lease of all the Government lands described in the Schedule, both hereunto annexed (hereinafter called "the said lands") upon the following conditions:—

I.—That the Government does not grant to the lessee, but hereby absolutely excepts and reserves to itself out of and in respect of the said land (1) all grounds situate in any part of the said lands already excavated or otherwise utilized for the aforesaid channels, and (2) all existing rights to and over all mines and minerals, coals gold-washings, and quarries together with all easements heretofore enjoyed by the Government in respect of the said lands or any part thereof.

II.—That the lessee will at all times permit the officers of Government to enter and do all acts and things necessary for the full enjoyment of the ground and the rights hereinbefore reserved to the Government to and over all mines and minerals, coals, gold-washings quarries, and easements, in or upon the said lands and all parts thereof,

III.—That the lessee will at all times on receipt of a requisition in writing signed by the Deputy Commissioner of permit the said Deputy Commissioner of to take possession of and to finally resume for the Government, as if this lease had never been executed, so much of the said lands as may from time to time in the opinion of the said Deputy Commissioner of be required for the construction [repairs or maintenance] of roads, water-courses [or any works connected therewith]: and the lessee will accept such compensation as may be fixed in each case by the Deputy Commissioner of in full satisfaction and compensation for the same.

IV.—That the lessee will pay the whole cost of the survey and demarcation of the said lands as calculated and fixed by the Deputy Commissioner of

V.—That the lessee will duly comply with such directions as the Deputy Commissioner of shall from time to time issue requiring him to construct boundary marks on the limits of the said land, and will keep them, when erected, in good repair to the satisfaction of the Deputy Commissioner of

VI.—That the lessee will pay the yearly rent hereby reserved, namely a sum of rupees ten, in such instalments, on or before such dates, to such person and at such place, as the Deputy Commissioner of shall from time to time appoint.

VII.—That the lessee will also pay when due all revenue, assessments and cesses imposed by competent authority in respect of the said lands or any part thereof.

And it is hereby agreed that until altered by the Local Government or other competent authority the assessment and cesses in respect of the said lands shall be as follows, that is to say the assessment will be—

		Rate per acre. Rs.	A.	P.
(*a*).	For each acre irrigated by canal water for a kharif crop ...	2	8	0
(*b*).	Ditto ditto rabi crop ...	2	4	0
(*c*).	For each acre which is cultivated with crops not irrigated by canal water	0	12	0

and the cesses will be—

Four annas upon each rupee actually payable as assessment, provided—

1st—That when any part of the said lands is irrigated for the rabi crop partly by canal water and partly by well water the assessment on the part of the said lands so irrigated shall be at the rate of Re. 1-12-0 per acre only for and during a period of 20 years to be reckoned from the sinking of the well from which the well water is derived. But this reduced assessment will in no case continue for more than 20 years in respect of any part of the said lands.

2nd—That when any part of the said lands is irrigated by canal water obtained by lift and not by flow a further reduction of six annas per rupee shall be made from any sum due as assessment under the above clause and proviso.

3rd—That from all sums due as assessment in accordance with the above clause and provisos a reduction of one-fifth part shall be made for the period of five years ending rabi

4th—That it shall be in the option of the Deputy Commissioner of Mooltan to remit in whole or in part any sum due as assessment in respect of any part of the said lands upon which the crops fail or do not come to perfection.

VIII.—That in consideration of the lessee's paying the rent hereinbefore reserved and duly observing the stipulations contained in Clause VII of this Lease, the Government covenants and agrees that in the event of canal water being supplied to the lessee during the currency of this lease in respect of the said lands or any part thereof the Government will itself pay all charges leviable on account of such water, both owner's rate and occupier's rate, referred to in the Northern India Canal and Drainage Act, 1873, Sections 36 and 37.

PROVIDED ALWAYS and it is hereby expressly agreed and declared by and between the Government and the lessee that nothing herein or in any part of this instrument contained shall be taken or understood to bind the Government to supply any water to the lessee in respect of the said lands or any part thereof or to vest in the lessee any right, title, claim, easement, or privilege whatsoever to or in respect of any water.

IX.—That the lessee will pay such rateable share of the cost of the construction of the channel or channels by which the said lands or any part thereof shall be or are capable of being supplied with water; the amount of the said rateable share to be fixed by the Deputy Commissioner of Mooltan, and to be paid in such instalments, with such interest, on or before such dates, to such person and at such place, as the Deputy Commissioner of Mooltan shall appoint.

X.—That the lessee may use for his own *bonâ fide* private purposes connected with the cultivation or reclamation of the said lands any trees or brushwood standing thereon; but such trees or brushwood shall not be sold, bartered, or exchanged or given away by the lessee.

XI.—That the lessee will not assign, transfer, or otherwise alienate or create any charge whatever, direct or indirect, upon, or part with the possession of, the said lands or any part thereof without the written permission of the Government first obtained.

XII.—That as often as he shall receive a requisition for labourers in writing signed by [the officer in charge of the Sidhnai Canal] stating—

(1) the nature and locality of the work to be done;

(2) the number of labourers to be supplied by the lessee;

(3) the approximate time for which, the place at which, and the day on which, the labourers will be required:

The lessee will without fail supply the said labourers (all adult and able-bodied) at the time and place specified in the said notice, and will be responsible that they or others in their stead shall continue present and at work until the work specified in the said notice is completed to the satisfaction of the said Canal Officer.

PROVIDED as follows: —

Firstly.—Such requisition as aforesaid shall be delivered to the lessee or left at the house in which he ordinarily resides not less than clear days before the labour is required.

Secondly.—The number of labourers to be called for by the said notice shall not exceed one labourer for acres of land held by the lessee and under cultivation at the previous kharif harvest.

Thirdly.—The said Canal Officer may by the notice aforesaid call for the said labourers for the performance of work of any description connected with the clearance, maintenance, or repair of the Sidhnai Canal and of its distributaries at any place, and during any period, subject to the general control of the Deputy Commissioner of

Fourthly.—The said Canal Officer shall pay the said labourers at daily rates to be fixed from time to time by the Deputy Commissioner of

Fifthly.—The daily rates for such labourers shall not be less than annas a day per head

Sixthly.—In the case of every labourer supplied as in this clause provided the daily payment shall continue for the whole period during which he is, in consequence of being so supplied, prevented from following his ordinary occupation.

XIII.—That the lessee will bring one-half of the said lands [reckoned exclusively of roads, hedges, ditches, and all other unculturable portions thereof, which, for the purposes of this lease, shall be conclusively taken as being per cent. of the said land] under cultivation within three years from the day of 188 , and two-thirds thereof, similarly reckoned, within five years from the same date: and that (without prejudice to the general clause for re-entry hereinafter contained) failing his so doing, the Government may forthwith without payment of any compensation whatever resume and repossess the whole of the said lands as though this lease had never been granted.

XIV.—That at or after the expiration of five years from the date of this lease the lessee, having duly paid the rent herein reserved and having duly observed the stipulations herein contained and to be by him observed, shall be entitled [at any time] to purchase from the Government the proprietary right in the said lands (but subject always to all the reservations set forth in Clause I of this instrument) on payment to the Government at the rate of Rs. 3 per acre: Provided that the event of any such purchase the purchaser, his heirs, legal representatives, and assigns, shall hold and possess the said lands and every part thereof subject for ever to all the provisions and stipulations herein contained, the following alone excepted namely clauses IV, VI, XI, XIII, XVI, XVII.

XV.—That no right of pre-emption shall be at any time acquired or acquirable in respect of the said lands or any part thereof.

XVI.—That so long as this lease shall continue in force, it shall be competent to the Government to cancel, alter, or modify, all or any terms thereof [*at each*] settlement of the Mooltan district, and the lessee shall be bound by any such cancellation, alteration, or modification.

XVII.—That this lease shall be deemed to be an agreement in writing within the meaning of Section 2 of the Punjab Tenancy Act 1868 whereby the application of the said Act to the said lands shall be wholly excluded.

XVIII.—That if the lessee fails to pay in manner hereinbefore provided the rent hereby reserved and to duly observe all or any of the stipulations herein contained and to be by him observed, then and in any such case the Government may forthwith without payment of any compensation whatever resume and repossess the whole of the said lands as though this lease had never been granted.

XIX.—That in the event of any dispute arising between the Government and the lessee during the currency of this lease as to the property and rights hereby reserved to Government, or as to any matter in any way relating thereto, or as to any condition of this lease, or as to any matter or thing anywise connected therewith, the said dispute shall be referred for the opinion of the Deputy Commissioner of whose decision shall be final and conclusive between the parties to this lease.

XX.—Any stamp duty payable in respect of this instrument shall be paid by the Government.

XXI.—That in every part of this instrument the terms "the Secretary of State for India in Council" and "the Government" shall be deemed to include the Secretary of State for India in Council, his successors, and assigns: the term "the lessee" shall be deemed to include the lessee, his heirs, legal representatives, and his or their assigns: and the term "the Government" shall be deemed to include also every person duly authorized by the Government of the Punjab to act for or to represent the Secretary of State for India in Council in relation to any matter or thing contained in or arising out of this lease.

In witness whereof the said parties have hereunto set their respective hands and seals the day and year first above written.

Signed sealed and delivered for and on behalf of the Secretary of State for India in Council by Deputy Commissioner of acting under the orders of the Honourable the Lieutenant-Governor the the Punjab. } (Sd). *Deputy Commissioner.*

Witnesses: { Signed sealed and delivered by the said *A. B.* in the presence of *I. J.* *K. L.* } (Sd). *A. B.*

Telegram, dated 1st April 1886.

From—Lahore, From—Punjab Secretary | To—Simla, To—Govt. of India, Rev. and Agrl. Dept.

No. 146. There are numerous applications for land on Sidhnai. Please wire sanction to immediate grant of leases on terms proposed in my No. 25 of 20th March. Questions as to division of revenue between Land Revenue and Irrigation Department can be reserved for decision at leisure.

No. 253 R.—49-6, dated Simla, the 4th May 1886.

From—C. S. Bayley, Esquire, c.s., Under-Secretary to the Government of India, Revenue and Agrl. Dept.

To—The Secretary to Government, Punjab.

I am directed to acknowledge the receipt of your letter No. 25, dated the 20th March last, on the subject of the settlement of the Government lands about to be irrigated from the Sidhani Canal in the Mooltan district.

2. The Governor-General in Council accepts the proposal of His Honor the Lieutenant-Governor, that the area commanded by each main water-course, amounting roughly to about 2,500 acres, shall be taken as the unit for the future village; that the village area shall be sub-divided into square blocks of 22·5 acres a-piece, and that the usual unit of grant shall consist of four blocks or 90 acres.

3. The conditions upon which it is proposed to grant the lands are embodied in the draft lease, which accompanies the letter under reply. Subject to the following remarks on certain clauses, the terms of the lease appear to His Excellency in Council to be appropriate.

Clause VII.—The proposal to amalgamate the water and land revenue rates in one sum is accepted as suitable to the condition of the tract, and there is no objection to the rates and cesses proposed, or to the remission of one-fifth of the revenue rates during the first five years of the lease. The Government of India would, however, be glad to know the grounds on which the Local Government is satisfied that the sum of eight annas, which it is proposed to remit for 20 years on each acre of the area irrigated in part by well water, affords sufficient compensation to the tenant for the expenditure incurred by him in the construction of the well. The proposal to authorise the Deputy Commissioner to remit the assessment when the crop does not come to perfection is approved.

Clause VIII.—This clause has, it is stated, been inserted under legal advise, and the Lieutenant-Governor is, no doubt, satisfied that the cumbrousness of the arrangement which it involves is a lesser evil than that which might result from an enquiry as to the legality of the "numerous instances of contrar-

practice in the Punjab," mentioned in paragraph 7 of Mr. Thomson's letter. It should, however, be noticed with reference to clause XIV of the proposed lease that the condition that the Government shall pay both owner's and occupier's rate is one which will continue for ever after the leasehold has been converted into a permanent tenure. This arrangement appears to the Governor-General in Council, as at present advised, calculated to tie the hands of the Government somewhat unnecessarily in respect of the policy which it may hereafter adopt for the management of its canal revenue. It seems possible that the measures now taken for irrigating and settling the Sidhnai tract, may lead to its future development, and that it may then be considered expedient to apply to it the system of occupier's rates generally in vogue elsewhere. This being so, I am to suggest for His Honor's consideration, whether any practical disadvantage is likely to result from omitting the clause from the lease, or from bringing it under clause XIV, so that, on the tenure ceasing to be leasehold, it shall no longer have effect.

Clause XII.—The Government of India accepts the proposal that such *cher* labour as may be required for canal repairs and clearances should be paid.

Clause XIII.—The conditions upon which the Government is entitled under this clause and clause XVIII to resume the tenure appears somewhat harsh; but the Governor-General in Council has no doubt that, under the directions of the Local Government, they will be worked leniently and seldom fully enforced.

Clause XIV.—It is suggested for the consideration of the Lieutenant-Governor, whether the necessity for purchasing the whole holding of 90 acres is not calculated unduly to check the acquisition of proprietary rights.

Clause XV.—The Lieutenant-Governor has, no doubt, adopted this clause which bars pre-emption advisedly, and the Governor-General in Council, though not fully convinced of its necessity in the case of small leases, is not disposed to object to His Honor's decision.

Clause XVIII.—This clause which survives the convertion of the leasehold into a proprietary tenure, might, His Excellency in Council considers, be included with advantage in clause XIV, as one of the conditions which lapse when the lease is redeemed, the proprietor becoming, thereafter, subject to the general land revenue law in respect of arrears and other breaches of the settlement compact. Its retention after the redemption of the *málikána* appears to be a contradiction in terms, and the Government of India would be glad to learn the grounds upon which it is considered necessary.

4. The proposal that water from the Sidhnai Canal should be given to village lands at the same rates as those at which it will be furnished to Government waste lands, the existing assessments being set aside, is approved.

5. In paragraphs 15 and 16 of Mr. Thomson's letter is discussed the question of the shares in which the assessment of the irrigated lands is to be divided between "Irrigation" and "Land Revenue" in the accounts. The Lieutenant-Governor proposes that there should be deducted from the gross assessment, and credited to the canal, a sum sufficient to cover the expenses of maintenance together with interest at 5 per cent. on the capital. For this purpose it is believed that a sum of Re. 1-6 per acre irrigated would suffice, but in order to preclude the possibility of loss, it is proposed that Re. 1-8 an acre should be taken at each harvest.

In regard to this suggestion, the attention of His Honor the Lieutenant-Governor is invited to the despatch from Her Majesty's Secretary of State for India, noted on the margin, of which a copy was forwarded to the Government of the Punjab with a letter No. 269 I., dated the 2nd October 1884, from the Secretary to the Government of India in the Public Works Department. In that despatch, and in the previous correspondence relating to the project, it was assumed that the share of the assessment credited to Irrigation would not be less than Rs. 2-8 per acre for the *kharif* harvest, and Re. 1-8 an acre for the *rabi* harvest. Under these circumstances, the Governor-General in Council regrets that he is unable, at present to allow any share smaller than those mentioned by Lord Kimberley

No. 47 P. W., dated the 28th August 1884.

to be credited to Irrigation. Should the Lieutenant Governor desire to make any further representation on this point, His Excellency in Council will be glad to consider it. The matter, however, is one of account, and it is not necessary that the issue of the leases should be delayed pending its decision.

No. 59, dated Lahore, 14th May 1886.

From—C. L. Tupper, Esquire, Junior Secretary to Government, Punjab,

To—The Offg. Senior Secretary to Financial Commissioner, Punjab.

In continuation of my letter No. 42, dated 16th April last, I am directed by the Lieutenant-Governor to forward, for the information and guidance of the Financial Commissioner, a copy of the correspondence marginally noted, and in connection therewith to convey the following instructions.

Government of India No. 253 R., dated 4th May 1886, first four paragraphs.

2. Cultivators should now be settled on both waste and village lands with the least possible delay, and the Joint-Secretary has to-day been addressed with a view to expediting in every way the arrangements necessary for irrigation.

3. With reference to the remarks contained in paragraph 3 of the letter now forwarded, I am to say that, for the reasons given by the Government of India, it will be convenient to bring Clauses VIII and XVIII of the lease under Clause XIV as being conditions which lapse when the lease is redeemed. With this exception the draft lease can stand as framed; but the square brackets which have sometimes been inserted without necesssity in the body of the lease should be omitted. I am also to notice that no schedule of lands is printed in the draft, but one will of course be added at the end of every deed issued.

No. 60, dated Lahore, 14th May 1886.

From—C. L. Tupper, Esquire, Junior Secretary to Government, Punjab,

To—The Joint-Secretary to Govt., Punjab, Public Works Dept., Irrigation Branch.

In continuation of my letter No. 43, dated 16th April last, I am directed by the Lieutenant-Governor to forward, for your information and guidance, a copy of the correspondence marginally noted.

Government of India No. 253 R., dated 4th May 1886, first four paragraphs.

2. I am to request that every effort may now be made to proceed with irrigation both in the waste and village lands, and in this connection I am to forward a copy of a letter* addressed this day to the Financial Commissioner.

* No. 59, dated 14th May 1886, to Financial Commissioner.

3. It will be observed that the sums to be paid by the cultivating irrigators have now been settled by the Government of India. The exact proportions in which the amounts received shall be credited in accounts between Irrigation and Land Revenue is a subject still under discussion. A further communication in regard to it will be made to you shortly. Meanwhile I am to say that no delay should be allowed in the grant of water for irrigation, as all matters of account between Departments can be subsequently adjusted in accordance with the orders of the Government of india.

No. 61, dated Lahore, 14th May 1886.

From—C. L. Tupper, Esquire, Junior Secoretary to Government, Punjab,

To—The Offg. Secretary to the Government of India, Revenue and Agricultural Department.

I am directed to acknowledge the receipt of your No. 253 R., of the 4th instant, on the subject of the settlement of the lands about to be irrigated from the Sidhnai Canal in the Mooltan District.

2. I am to request the favour of being supplied with a copy of the despatch from Her Majesty's Secretary of State for India, No. 47 P. W., of the 28th August 1884, quoted in the concluding paragraph of your letter under reply, but of which no copy can be traced in this office. I am to add that when this is received His Honor will probably make a further representation on the question of the division of the revenue between Irrigation and Land Revenue.

3. The favour of an early reply is requested.

G.

Papers on the Inundation Canals in the Muzaffargarh District.

14. About 200,000 acres of cultivation are irrigated by inundation canals. These in good years flow from the 15th of April to 15th September, occasionally a fortunate set of the river or greater activity than usual in clearing enables a canal to flow all the year round.

Canals.

The canals are 53 in number, of which 11 have their heads in the Chenab and 42 are fed by the Indus. Their total length is 699 miles. This mileage does not include the side channels of the Indus in which the canals have their heads, and which themselves supply a good deal of lift irrigation.

Number and mileage.

The area irrigated has been measured four times hitherto with the following result:—

Area irrigated.

	Acres.
At Regular Settlement in 1873-75	203,666
By canal measurements in 1877	205,000
Do. do. 1878	210,206
Do. do. 1879	186,051

The areas irrigated by the Chenab and Indus Canals, respectively, at the Regular Settlement survey were as follow:—

	Acres.
Chenab canals	3,715
Indus canals	166,551

The land-revenue depending on the canals according to the Regular Settlement is—

	Rs.
Chenab canals	69,435
Indus canals	229,640
Total of district	299,075

15. Before describing each canal, attention is invited to the accompanying map. Before what is now the Muzaffargarh district was united under Sáwan Mal, the Sikh Governor of Mooltan, it was divided between four governors in whose time most of the canals were made. The present Sanawan tahsíl was governed by Nawáb Muhammad Khán, Sadozaí of Mankerá, here known as Nawáb of the Thal. The country lying opposite Dera Gházi Khan and containing the Talúkas of Aráin, Kinjar, Serí, Trund and Mahrá was subordinate to the Nawábs Ghází Khán, Nawáb Mahmúd Gújar and the Kalhorá governors of Dera Ghází Khan and after the Sikh conquest, passed into the possession of the Nawábs of Bahawal Khán. The country lying opposite Mooltan and containing the Talúkas of Rangpúr, Murádábád, Muzaffargarh, Khángarh and Ghazanfargarh was under Nawáb Muzaffar Khan, the Pathán Governor of Mooltan. The Alípur tahsíl and the the Talúka Khoran of Muzaffargarh tahsíl were ruled by the Nawabs of Bahá-walpur. Though these rulers were not quite synchronous, they may be treated as such in order to classify the bewildering list of names connected with the founding of the canals. The Muzaffargarh district was united under Sáwan Mal in 1833 A.D., but he had held the country round Muzaffargarh in farm from Ranjít Singh, since 1822 A.D. A minute history has been prepared of each canal in the Vernacular, canal record which has been made at the Regular Settlement and which will be found useful in deciding canal disputes: a short account of the most important canals may be given here.

History and description of the canal.

16. The 11 Chenab canals differ from the Indus canals in having their heads independent of one another. On the Indus, a number of canals have their heads in a phat or side-channel and can be described together.

Chenab Canals.

1. The Karamwah canal has its head in the village of Maksúdpur at the north-east corner of the district. Its length is 22 miles. It irrigates 997 acres, paying a revenue of Rs. 1,472. It was a natural branch of the Chenab which was improved by Karam Narain, son of Sáwan Mal, when the former was Governor of Rangpur. He spent Rs. 5,000 on the work and repaid himself by levying a rupee on each well, till the whole sum was recovered.

2. The Ganeshwah, after many changes of head takes off from the Chenab at Langar Sarai. Its length is 28 miles and irrigates 5,806 acres, paying a revenue of Rs. 10,487. The Ganeshwah was dug in the time of Nawab Muzaffar Khan by the villages which it was to irrigate. It was then called the Ghoushwah. In the time of Sáwan Mal its name was changed to Ganeshwah which it still keeps. In 1879, a new branch called the Walíwah was added to the Ganeshwah. It leaves the main canal at the village of Khanpur and runs parallel with it for twelve miles. It irrigates the country west of the Ganeshwah.

3. The Tolawah has a length of six miles. It irrigates 1,025 acres, paying a revenue of Rs. 1,777. It was dug by the villages of Doaba, Talírí, Lalpúr, Hajipur and Chak Chajra, in the time of Mulraj, Governor of Mooltan, under the supervision of Raizada Tola Ram, Kardar of Muzaffargarh.

4. The Talírí is the largest canal in the Muzaffargarh tahsíl. The main line is 12 miles long. It has the following branches:—

The Talírí Canal.

	Miles.
Hájíwah	13
Khánwah	6
Pírwah	4
Nángníwah	5
Khokharwah	3
Núrwah	4

The whole length of the Talírí and its branches is 47 miles. It irrigates 14,004 acres of the richest land in the district, paying Rs. 32,829. The Talírí was originally a side channel of the Chenab. Its name then was "Trailare" or "Three branches," now corrupted to Talírí. In the time of Sáwan Mal it was improved and made into a canal and connected with its branches, all of which are older than the main line, having been dug in Nawáb Muzaffar Khan's time. The course of the Talírí had lately become very tortuous, and in 1875-76 the irrigators agreed to supply 30,000 laborers to straighten it. They were assisted by a money grant of Rs. 4,000. Loops were taken out of it, which reduced the length of the main line from 16 to 12 miles.

5. The Gajjúwah is 5 miles long. It irrigates 826 acres, paying Rs. 1,505 revenue. This canal is not under Government supervision, but is managed by Allah Dad Khan, the Honorary Magistrate of Khangarh, whose ancestors, with other proprietors, excavated the canal. He owns lands in the village of Gajjúwahan. Hence the name of the canal.

The Gajjú Canal.

6. The Jhangawarwah has a length of 17 miles, including its branches. It irrigates 7,795 acres, paying a revenue of Rs. 13,359. It was dug during the Baháwalpur rule by the villages which irrigate from it. For the last ten years this and the Ghazanfar canal have had one head. In 1880 separate heads have been made. The heads of both canals are in the village of Kuthela. The irrigators on the tail of the Jhangawarwah have had great fights with the Kuthela people. The canal is said to have been named from jang, a fight. Besides the

The Jhangawar and Ghazanfar Canals.

Ghazanfarwah, which has hitherto been considered a branch of the Jhangawar, there is another branch called the Muhammadpuri.

The Alíwah.

7. The Aliwah canal has a length of 4 miles. It irrigates 1,139 acres paying Rs. 1,378 land revenue. It was dug in the time of Sáwan Mal by the villages which irrigate from it. It was named after one Alí who managed the excavation.

The Khalíwah.

8. The Khalíwah has a length of 13 miles. It irrigates 5,018 acres, paying a revenue of Rs. 5,971. It was dug in the time of the Bahawálpur Government by the villages which irrigate from it.

The Langarwah and Jhalárínwah.

Besides the canals above mentioned, there are two small canals, the Langarwah and Jhalárínwah, but they are now much neglected. All the Chenab canals above mentioned are in the Muzaffargarh tahsíl. The Jhandúwah branch of the Khalíwah irrigates part of the villages of Kalarwálí and Rukanwálí in the Alípur tahsíl.

The Nángwáh.

There is a canal now disused, called the Nángwáh, which used to have its head in the village of Makhan Bela, opposite Alipur, which might easily be restored.

Indus Canals.

17. The marked difference between the Chenab and Indus canals is that the former mostly have their heads in the main stream of the river, while the latter take off from side-channels, and their heads are therefore protected from erosion. The side-channels known as the Chitá meaning "Mad" leaves the river a little south of Márí in the Bannu District, were the Indus emerges from the Salt Range, and is nearly continuous to about the middle of the Muzaffargarh district at a point a little south of the town of Kinjar. The banks of the Chitá are low, and though fairly permanent, it is apt to change its course. West of the Chitá, between it and the high bank, fed by the Chitá and running for the most part parallel with it, are other natural channels of a more permanent character. Beginning from the north these are in succession :—The Garku, Magassan, Maggí, Suk and Dingá. South of Kinjar, the Chitá disappears, and for the rest of the length of the Indus in this district, the feature of a double set of side-channels is lost. The remaining canals below the Chitá take off either from the Indus or from small side-channels, within a short distance of it. It is a question whether any real efficiency of the Indus canals can be secured which does not embrace the study and improvement of the side-channels of the Indus.

Gulzári Canal.

Beginning at the north-west corner of the district were the Indus enters it, the first canal we come to is the Gulzári which irrigates the village of Ahsanpúr. This canal has been much neglected. Its head is in the Chitá, but it only works when that channel is in the high flood. It is not regularly cleared.

Garkú or Matka series.

South of Gulzári comes a group of four canals. The Hinjrái, Dín Muhammad, Khán Chand and Nángní. This group is called the Garkú series in canal official language because the canals have their heads in the Garkú nálá which is fed by the Chitá. In Settlement records the group is called the Matka series after Mian Matka, a Kárdár of Daira Din Panah under the Sikhs, who excavated or improved every canal in the group. The Hinjrai and Dín Muhammad have a comman head in the Garkú. The Khan Chand and Nangni have also a common head. The Khan Chand, according to tradition, was once much longer, and used to irrigate as far south as Gujrat, which is 28 miles south of the present tail of the Khan Chand. The Nangni is named from Náng, a snake, in consequence of its tortuous course. The Garkú or Matka series irrigates 9,175 acres near the town of Dairá Dín Panah, paying a revenue of Rs. 13,239.

Magassan series; Fazalwah, Choudhriwah, Ganda Bhubhar, Ganda Parihar, Rajjuwah, Karia Choudhri, Sardarwah, Nangni Khurd, Nangni Kalan, Jan Mohammad, Pirwah, Hamzawah, Dogari, Chakar Khan, Trund, Chuan.

The Magassan channel has its head in the Chitá, and feeds the 16 canals mentioned in the margin. The main line of the Magassan is 12 miles long. The canals which it feeds irrigate 30,393 acres, paying a revenue of Rs. 40,164. The country, from 3 miles north of Kot Adu to 5 miles south of Sanáwan, is irrigated by this series, and its branches reach far into the Thal. The careful clearance of the Magassan is of the most vital importance. In 1879 the clearance was neglected, and the area irrigated fell to 14,000 acres—a falling off of 18,000 acres. The main canals of this series are as follow :—The Fazalwah, which was excavated under the supervision of Fazal Hossain,' Tahsíldár, in 1862 A.D. It irrigates 1,074 acres, paying Rs. 1,404 in the neighbourhood of Kot Adú. The Choudhriwah was excavated 90 years ago by Choudhri Paira Ram, grandfather of Kirpa Ram, the present Choudhri and Zaildár of Kot Adú. It irrigates 3,242 acres, paying Rs. 4,382. The Sardarwah was excavated in the time of Nawab Muhammad Khan of Mankera. It has four branches—

The Muhammadpúrí,
The Khanpúrí.
The Kariá Gámán.
The Karia Sanánwán.

It irrigates 7,831 acres, paying Rs. 10,181 revenue. It is capable of great extension into the Thal. The Chákar Khan was originally excavated by a colony of Gurmání Biloches in the time of Nawáb Muhammed Khán and, after many changes of channel and name fell into the course made for it by Chákár Khan, a lawless chief of the Gurmánís, who was alive at the beginning of British rule, and about whom Mr. Simson, Settlement Officer, in 1854 A.D., writes in very uncomplimentary terms. The Chákár Khan irrigates 4,068 acres, paying Rs. 5,185 revenue. The last canal of the Magassan series is the Chuán, which means a coruscation, a meteor. Unfortunately for its name it is one of the slowest-running canals in the district. It was excavated in the time of Nawáb Muhammad Khan, under the supervision of *Hamíd, Kárdár*. It irrigates 3,358 acres, paying Rs. 5,065 revenue.

The Maggí, Súk and Dinga series.

South of the Magassan is the Maggí channel, which is fed direct from the Indus. One canal, the Khudádád, has its head in the Maggí. It irrigates the Thal country about Mahmúd Kot. It was excavated under Hamíd, the Kárdár before mentioned. It is 13 miles long, and irrigates 3,395 acres paying Rs. 5,065 revenue. It was renovated in the time of Mír Muhammad, a noted Tahsíldár of Kot Adú, who named it the Khudádád. After sending out the Khudádád, the Maggí divides into two branches—the eastern branch is called the Súk, "dry," and the western the Dinga or "crooked"—each of which feeds a group of canals.

The Súk series.

The Súk series comprises the Kotwáh, the Háji Isbákwáh, the Jhákhriwáh, the Sánhwáh, the Thalwáh, and the Sardárwáh Khurd.

The Kotwáh.

The Kotwáh was dug in British rule by the villages which irrigate from it. It is 8 miles long, and irrigates 3,025 acres paying a revenue of Rs. 3,815. It irrigates the country round Mamud Kot, whence it derives its name.

Háji Isbákwáh.

The Háji Ishákwáh was excavated in the spring of 1878, and irrigates the country round Gujrát and Mahmud Kot. The villages that benefit by it subscribed Rs. 1,500. and Government contributed Rs. 500. It irrigates 2,359 acres paying Rs. 2,809 revenue. It is 5 miles long. It is named after a robber-saint whose shrine is in the village of Gujrát. At this point the canals which owe their origin to Nawáb Muhammad Khan of the Thal begin to end, and we enter the country ruled successively by the Mirháni Gujar and Kalhora governors of Dera Ghází Khan, and which, after the Sikh conquest in 1830, was farmed by the Nawáb of Baháwalpur. At the same point we leave the Sanánwán tahsíl and enter the Muzaffargarh tahsíl. The heads of the next four canals are in Sanánwán, but they irrigate mostly in the Muzaffargarh tahsíl.

The Jhákhriwáh.

The Jhákhriwáh was excavated first in the time of the Nawabs of Baháwalpur. It was afterwards improved and extended by Malik Gamun Jhakhar, a famous zamíndar who owned land in various parts of the district, and whose descendants still live in Kotla Gamun, in the *Alípur* tahsíl. In its best days it reached to Daira Yadhu, 12 miles further than its present tail, which is in the village of Sabzojat. It is 15 miles long, and irrigates 7,002 acres paying Rs. 9,518 revenue. Its operations extend through the Thal of the Muzaffargarh tahsíl, and magnificent crops of indigo are grown on it. The Jhákhriwáh is named after the tribe to which its improver, Malik Gamun, belongs.

The Thalwah.

The Thalwah is the last of the canals dug in the governorship of Muhammad Khan, the Nawáb of the Thal. Its length is 10 miles; it irrigates 4 villages of the Sanánwan tahsíl and 24 villages of the Muzaffargarh tahsíl. The area watered by it is 5,254 acres paying Rs. 7,589 revenue. Its influence lies entirely in the Thal, and like the Jhákhriwáh, fine crops of indigo are grown on it. The Sanwah was dug in the time of one of the Ghazi Khans. It irrigates 1,836 acres paying Rs. 2,799 revenue. Its length is 7 miles. At one time it refused to run, and the irrigators consulted a Thal saint, Muhib Jahánia, who told them that a buffalo-bull (Sanh) would come out of the Suk, and that they were to follow it and dig a new canal along the course which the bull took. Hence its name the Sánwah.

The Sardarwah Khurd.

The Suk at its southern end narrows into a very small channel, which is treated as an artificial canal and kept cleared. It irrigates 854 acres paying Rs. 1,179 revenue. The name of this channel is the Sardarwah Khurd.

The Dinga series.

The western branch of the Maggí is the Dínga, or "the crooked," which feeds the following canals :—

The Kálúwáh.
The Sardarwah Kalán.
The Sardarwah Khúrd.
The Nangni or Nangwáh.

The Sardarwah Khurd.

They irrigate the apex of the Thal and country about Kínjar. The Sardarwah Khurd was excavated seventy years ago, under the government of Baháwalpur. It irrigates 725 acres paying Rs. 1,169 revenue.

The Kaluwah.

The Kaluwah was excavated in 1839 A.D. by Diwan Sáwan Mal. At that time there was a great famine (kal), said to have been caused by the advance of the British army with Shah Shuja to Kandahar, and the canal was named after kal, the famine. The Kaluwah passes through the country at a high level, and is a first-rate irrigator. The Shahgrah Dhand is used as an escape for its surplus water. The Kaluwah irrigates 3,322 acres paying Rs. 4,799 revenue. Its length is 8 miles.

The Sardarwah Kalan.

The Sardarwah was excavated two hundred years ago by one of the Ghazi Khans, and improved about fifty years ago by Diwan Sáwan Mal. Its length is 16 miles. It irrigates 14,781 acres paying Rs. 25,499 revenue. This canal wants an escape badly for its surplus water, which does great damage at and about the village of Pakka Ghalwan. The road from Khangarh to Kinjar is sometimes rendered impassable by the floods from this canal.

The Nangwah or Nangni.

The Nangwah was dug by the villages near Kínjar; the date of its excavation is not certain. Its length is 14 miles. It irrigates 1,993 acres paying Rs. 7,573 revenue.

The Chita series.

The next group of canals have their heads in the Chitá channel. They are as follows :—

Adilwáh.	Bihishtiwáh.
Pírwáh.	Sardárwáh.
Rájwáh.	Ghílúwáh.
Rerhúwáh.	

The Chitá is here called also the Guthú, and, where it passes through the village of Dárín, the Dárínwála Dhand.

The Adilwáh.

The Adilwáh was dug by the villages which irrigate from it under the supervision of one Adil, an agent of the Baháwalpur government. It is 12 miles long, and irrigates 10,546 acres paying Rs. 15,870 revenue. It is a first rate irrigator, and often continues to run through the cold season.

The Pirwáh.

The Pírwah was originally dug, twenty years ago, by a combination of three villages, Rohillanwálí Bhundewálí and Ponta Malána, which are said to have spent Rs. 15,000 on it. Afterwards other villages obtained water from it. On this canal occurred the only case known in the district of selling irrigation rights. Ali and others, of Ponta Malána, sold two-eighths of their right in the water to the village of Rohillanwálí for Rs. 200. The village of Rohillanwálí has been treated rather badly this year (1880). An escape has been dug to carry off the surplus water of the Talírí canal system. This escape passes through the western part of Rohillanwálí and cuts through the Pírwah, preventing water from reaching the village. The Pírwah, is 13 miles long, and irrigates 2,322 acres paying Rs. 3,125 revenue. A masonry aqueduct should be made to carry the Pírwah, across the Rohillanwálí escape.

The Rájwáh.

The Rájwah was dug in the time of the Baháwalpur government, and irrigates the country in the neighbourhood of the large village of Mahra. The canal is named from Ráj, a local word meaning people, subjects, showing that the canal was dug without assistance from the government. The Rájwah is 9 miles long, and irrigates 3,671 acres paying Rs. 5,710 revenue.

The Rerhúwah.

The Rerhúwah was dug during the government of Baháwalpur by the following nine villages :—Metla, Bastí Jhangar, Hasanpúr Kacha, Gindi, Khakhi, Kushak, Aludewáli, Thakranwála and Mohriwála, which are said to have spent Rs. 7,000 on it. Its name means "the roller," from rerhan, "to cause to roll." It is 12 miles long, and irrigates 4,315 acres paying Rs. 6,277 revenue.

The Bihishtiwah.

The Bihishtiwah was first dug in the time of the Ghází Khans. After running for forty years it became unserviceable. In 1861 the irrigating villages subscribed some money, and, having got Rs. 5,000 takávi from Government, renovated the canal and dug a new head to it. The Bihishti crosses the country at a high level, and is a first-rate irrigator. It waters 5,047 acres paying Rs. 5,087 revenue. With the Bihishti we enter the Alípur tahsíl.

The Sardárwah.

The Sardárwah was dug by a combination of villages under the government of Baháwalpur. It waters a few villages of the Muzaffargarh tahsíl and the country about Shahr Sultán. It runs at a high level, and first-rate crops of sugarcane, indigo and rice are grown on it. It is almost too good an irrigator, for it occasionally floods the country. It badly wants a regulator near its head and regulators at the heads of its branches. It irrigates 9,073 acres paying Rs. 9,676 revenue. Its length is 17 miles.

The Ghiluwah.

The Ghiluwah is 7 miles long, and irrigates the south-western corner of the Muzaffargarh tahsíl. It irrigates 2,453, acres paying Rs. 3,083 jama. From this point to the extremity of the district the canals do not group themselves round side-channels of the Indus, but have their heads singly in the river or branches of it.

The Puránwah.

The Puránwah is an old channel of the Indus, which about one hundred and fifty years ago dried up and received the name of Purán, "the old." About this time the Nawáb of Baháwalpur levied one labourer per well from the villages which would benefit, cleared out the old channel, and made it into a canal. In 1840 A.D. the canal had become unserviceable. In 1844 Diwán Mulráj, Governor of Mooltan, contributed Rs. 4,000, and levied Rs. 12,000 from the irrigating villages, and again excavated the canal. Up to 1876 it was neglected. In that year the irrigators supplied an additional number of labourers, and Government contributed Rs. 4,000, and the canal was again cleared and made in to a very fine

work. The Purán has 38 large branches besides small distributaries. It irrigates 34,010 acres paying Rs. 40,130 revenue. Its length, including branches, is 105 miles; excluding branches, the length of the parent canal is 29 miles. The chief branches of the Puránwah are—

The Bakhíwáh.
The Kapre Khas (clothes snatcher).
The Nimánáwáh.
The Kutabwáh.
The Pírwáh.
The Khánwáh.
The Baháwalwah.
The Kádirwáh.

The Suhrábwah.

Every government that ruled this country has had a hand in the Suhrábwah. The Nawab of Gházi Khán dug it. He was followed by the Baháwalpur ruler, who levied one pai* per path† of grain as water-rate for having improved it. In the time of Sáwan Mal a new head was dug. Two new heads were dug during British rule. The Suhráb has two large branches, the Mughalwah and Ratánwah. The latter was renovated in 1879. The Suhráb irrigates 5,203 acres of very good land, paying Rs. 8,191 revenue, in the neighbourhood of Jatoi.

The Chhaliwah.

The Chhaliwah was originally an independent canal, having its head in the Sohni Dhand, which flows between Jatoi and the Indus. It was dug by Kázi Ghulám Murtaza, when Tahsíldár of Alípur. The Suhráb now tails into it, and it is really part of the Suhrábwah. The Chhaliwah irrigates 1,304 acres paying Rs. 2,028 revenue.

The Sulemánwah.

The next two canals, the Sulemánwah and Khánwah, present a new feature—they only work when the summer level of the Indus is low. When the flood rises high, all traces of these canals are lost in the general submersion. The Sulemánwah has its head in a side-channel of the Indus, here called Mochiwála Dhand, from the village through which it passes. It was dug during the Baháwalpur government, and named after the Kárdár, Sulemán Khan. It irrigates 3,301 acres paying Rs. 3,866 revenue. It is 14 miles long. If the floods are moderate, fine rice crops are grown on it.

The Khánwah

The last canal before we reach the junction of the rivers is the Khánwah. It was dug during the government of Baháwalpur. Its head is in the village of Bosan and it is fed by the Khakhi Dhand. It irrigates 590 acres paying Rs. 702 revenue.

The canal geography of Muzaffargarh has now been described. There are other small water-courses and distributaries; for an account of these, and for a more detailed account of each canal, the canal record must be referred to. The canal geography is not very easy to grasp. The canals are very numerous, and the same names occur over again; but if their grouping into series is studied, it will be easy to remember them. The 11 Chenab canals must be studied separately, for they admit of no grouping for two-thirds of the length of the district. The Indus canals arrange themselves into the following groups according to the side-chnnels by which they are fed:—

1. The Garku or Matka group.
2. The Magassan group.
3. The Maggi group.
4. The Suk group.
5. The Dinga group.
6. The Chitá group.

South of this last remain the four independent canals—

Purán.
Suhráb plus Chhali.
Sulemánwáh.
Khánwáh.

There are six Nangwahs or Nangni—one in the Garku, two in the Magassan, one in the Dínga series, one is a branch of the Talírí, and the disused Nangwah

* A pai is equal to 16 sers. † A path is equal to about 32 maunds.

in the Chenab opposite Alípur. All these are named from their snake-like tortuous course. There are five Sardarwahs—one in the Magassan, one in the Suk, two in the Dinga and one in the Chitá series. There are three Pírwahs—one in the Magassan, one a branch of the Talírí, and one a branch of the Puránwah. There are three Khánwahs—one a branch of the Talírí, one a branch of the Purán, and one independent Khánwah, the most southern of all the Indus canals. The Khánwahs were all dug in the government of Baháwalpur, the ruler of which is here known as the Khan.

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Canal administrations, past and present.

7. Under former Governments the annual clearance and repairs were usually effected by levying so many laborers per well or per yoke of oxen. Fifty or sixty bighas of waste land were considered equal to a well for the purposes of this levy. When the work was unusually heavy, the irrigators subscribed cash to engage hired laborers. Occasionally the Government of the day gave money assistance for the execution of works, and recouped itself by levying a share of the crop at harvest. Under the Baháwalpur Government a cess of one *pai* of grain per *path* was levied for clearance and excavation of the canals. Under Sáwan Mal, grants of money were made to assist the excavation and clearance. The kárdárs were responsible for the work being efficiently done. They had unlimited powers, and compelled attendance of the laborers by force, and punished shirkers. Under their administration the irrigators rarely failed to supply the required amount of labor. Judging from old accounts, from the greater extent of canal cultivation, from the number of disused canals, and from the diminished length of the remaining canals, the canal administration under former Government, was closely supervised, and, especially under Sáwan Mal, was very effective.

Canal administration under British rule.

8. From annexation to 1857 the administration of the canals may be described as absolute neglect. The old system of active interference on the part of Government was withdrawn, and the canals were left to get on as best they could. In 1858, Mr. Henderson, Deputy Commissioner, laid down an efficient scheme of canal management, which, with few changes, has stood its ground to this day. Its author, however, did not contemplate with what inertness it would occasionally be worked. A record of facts regarding each canal was prepared. The responsibility of the irrigators for supplying labor for the annual clearance and repairs was asserted and enforced by the imposition of a fine on those persons who absented themselves from the work. The fine was first 2 annas per head per day, then progressively 4, 6, 8 and 12 annas. In 1874 it was reduced to 8 annas, at which it still remains. On each canal a committee of management, the members of which were called sarpanches, was chosen from among the irrigators, and one or more water-bailiffs, called mimhars, were appointed. Their duties were to summon the laborers for the clearance, and to distribute the water when the canals were running. A darogha was appointed for each tahsíl, and paid from the absentees' fine fund. The sarpanches were remunerated by the remission of part of the quota of labor which they were bound to supply. The mimhars were paid by the irrigators. The mode of payment differed. On some canals they received from Rs. 5 to Rs. 7 per month in cash, and two topas=8 sers of grain, per well at harvest. On others they received four or five topas per well at harvest, and no cash allowance. The procedure for effecting the annual clearance and repairs was as follows. Each year when the canals ceased to run, the sarpanches and mimhars, with the darogha, inspected each canal. They decided how many labourers were wanted for the clearance, and how long the work would take, and then submitted a petition through the Tahsíldár, saying that they wished to supply so many labourers for such and such a period. When the Deputy Commissioner's sanction had been obtained, a muharir and one or more chaprasis were appointed for each canal, and the number of labourers fixed on for the canal was distributed in proportion to the land-revenue paid by each irrigator, so that each person knew the number of laborers that he had to supply. Then a proclamation, *vakara*, was issued by the Tahsíldár through the sarpanches, fixing the date for the clearance to begin, which was generally in

December. The clearance was done in two ways. All the laborers began at one end of the canal and worked through to the other. This mode is called *súrh*. The other mode is as follows. The canal was divided into lengths, and each village cleared the length allotted to it. This mode is called dak. During the clearance the moharir kept up a roster of the laborers present and absent, and at the end of the work each irrigator who had not supplied his quota of laborers was debited with the number of laborers which he had not supplied at the rate of fine which was then current. The fines, as well as income from the sales of grass and wood from the canal banks, were credited to a fund devoted to the general improvement of the canals. The fines and the fund are termed *zar-i-nágha*, or, in common parlance, *nánga*. A gang of laborers is called *cher*, which also means a drove of cattle, and each member of the gang is called a *cherá*. If, while the canals were running, any emergent work was required to be done, such as mending the bank which had burst, or clearing the head which had silted up, additional laborers were called out. Such laborers are called the *chikar chher*, or "mud gang," because they have to work at a time when the clay has been turned into mud by the canal water. It speaks well for the readiness with which the people are ready to help one another that it is not found necessary to levy *zar-i-nágha* to ensure attendance at the *chikar chher*. From 1858 to 1878 a person wishing to obtain irrigation for land that had not hitherto received it, or to cease to receive canal water, had to obtain special permission, which was only granted after inquiry. In practice, it was easy enough to be brought on the roll of irrigators, but almost impossible to get removed from it, and, consequently, from the obligation to supply labor, one of the worst abuses, connected with the management of the canals was, that men were kept on the labor list for years after they had ceased to obtain water, and this though the failure of water arose from causes beyond their control. In 1878 this system was changed, the irrigated area was measured, and the number of laborers distributed over the irrigated area only. The theory that the labor was supplied voluntarily was strictly kept up, and no active Tahsíldár could get the annual clearance done, or any work of improvement effected, until he had got a voluntary petition from the irrigators to be allowed to supply so many laborers. The Tahsíldár was full of zeal, and wanted to get great works done and make a name for himself. He also knew that unless the canals were well cleared he would find it difficult to collect his revenue, and so would get into trouble. On the other hand, the irrigators were improvident beyond description and did their best to avoid supplying labor, and amusing contests between these rival wishes occurred. It is even said that in darker days the committee of management was locked up until it agreed to satisfy the Tahsíldár's requirements as regards labor. Mr. Henderson's system started well, but it was badly worked. The Deputy Commissioners and the Tahsíldárs had not the time or the knowledge to manage canals, which got worse and worse. They were not fully or regularly cleared out, and consequently decreased in width, depth and length. The level of their beds having thus become higher, the supply of water was prevented from entering the canals as early, and from continuing to flow as long, as when they were well cleared. In 1876, when the canals had reached their worst, improvements began to be made. A Tahsíldár was specially appointed to look after the canals, and as much as was possible without professional help was done in the way of reforms. In March 1880 Government sanctioned the formation of the Muzaffargarh canals into a Public Works Division; Mr. E. A. Sibold, C.E., was appointed Executive Engineer.

Arrangements for the future management of the canals.

9. It only remains to describe the arrangements made for the future management of the canals by the Revenue and Canal Officers. The number of laborers required to execute the annual clearance and repairs has been fixed for the next five years. The obligation to provide the number of laborers fixed has been made part of the settlement of land revenue, and is recorded in the administration paper of each canal village. The penalty for non-attendance has been fixed at 8 annas per man per day, and has also been recorded. Every year in August and September the canal-irrigated land will be measured by the patwáris, and the results will be communicated to the Executive Engineer in the following form :—

Abstract Statement (khátáwár) of Canal-irrigated land for S. F. 1287 in Mauza———

1	2	3	4	5	6	7	8	9	10	11	12	13
					DETAIL OF IRRIGATION.					DETAIL OF AREA UNDER EACH CROP FOR THE HOLDING.		
						Total area of holding irrigated by canal by girdáwári.						
Girdáwári number.	Name of well or jhalár or patti.	Number of proprietor's holding in the Settlement Khewat Khatauni.	Proprietor's name, parentage, caste, and residence.	Name of cultivator, his parentage, caste, and residence.	Number in Settlement of Khasra of fields irrigated.	By flow.	By lift.	Total.	Name of canal and of cut.	Kharíf.	Rabi.	Remarks including note of demand for canal-advantage rate where due.

The Executive Engineer will then distribute the number of laborers fixed for each canal over the area irrigated in the preceding year, and will inform each irrigator of the number of laborers which he will have to supply for the clearance and repairs, and of the time when the work will begin. During the clearance, the roster of attendance will be kept by the moharir as before, and as soon as the work is finished the Executive Engineer will prepare a statement for each village showing the amount due from each irrigator on account of non-attendance fines. He will send these lists to the Deputy Commissioner, who will collect the amount with the rabi instalments in June and July.

Canal records.

10. A record of each canal has been made at the settlement. *It consists of the following papers* :—

I. A map of the canal on a scale of 240 karams, or 1,320 feet, to the inch, showing—

(1) The canal.

(2) Its branches.

(*a*) in use (karia and kassi),

(*b*) disused (khandar),

(3) The estates irrigated from the canal, with their boundaries.

(4) Chhabs, *i.e.*, previous dams for raising the level of the water.

(5) Jhalárs.

Besides these, the boundaries of the villages, irrigations, and the village sites are shown. The irrigating villages, the estates, and the branches are numbered on the map, and the numbers correspond with the numbers in the administrative paper of the canal.

II. An administration paper divided into the following heads :—

(1) History of the canal.

(2) List of villages irrigating.

(3) List of the branches, with the history of each branch and an account of how the annual clearance is made.

(4) Dams (chhabs)—who may erect and with whose leave.

(5) Jhálars.

(6) Annual clearance and emergent works—how executed in former times and at present.

Land-revenue.

11. Under the orders conveying sanction to the assessment reports, it has been decided that the whole of the revenue assessed on land irrigated from canals alone, and two-thirds of that assessed on land irrigated by canals and wells, shall be credited to the Canal

on occasions of failure of canal irrigation, and this has been accordingly done in both districts. The rules approved by the Local Government for the above purpose are detailed by the Settlement Commissioner in paragraph 11 of his letter recited in the preamble, and the present settlement is sanctioned subject to the observance of their provisions in all cases. Hitherto no remissions have been found necessary, and, as pointed out by the Financial Commissioner, the system has this advantage that a decline in the revenue will immediately attract the attention of the higher Revenue authorities of the Province to the imperfect working of the canals. Lands to which canal irrigation may be extended hereafter will be charged at a rate of 6 annas per acre in the Sanánwan tahsíl, and of 8 annas per acre in the other two tahsíls. A *pro forma* credit of two-thirds of the assessment of lands watered by canals and wells, and of the whole of the assessment of lands watered by canals alone, is taken by the Irrigation Department; the whole of the income, however, is actually credited in the accounts as land revenue, and is shared under the present Provincial contract by the Supreme and Local Governments in the proportion of 60 and 40 per cent.

16. The annual clearances of the canals on which the prosperity of the district so greatly depends are effected by the people themselves under the direction of the officials of the Revenue and Irrigation Departments and of the Canal Committees. No charge, therefore, is made for the use of canal water over and above the demand on account of land revenue. A good description of the general features of the system of clearances called *cher* is given by the Settlement Officer at pages 100—102 of his report. The most important points embodied in the *cher* rules, as finally revised and attached to this Resolution, are as follow. The total *cher* assessment of each canal will be fixed by the Divisional Canal Officer, in September of each year, in consultation with the Committee of the Canal. The assessment will be based for the most part on a consideration of past assessments, and will be expressed in the form of so much *cher* labor for each acre irrigated by the canals during the current autumn harvest and the ensuing spring harvest. For each canal a committee, or sarpanch will be appointed. Every committee-man must possess certain qualifications, and will be appointed for five years. Two-thirds of the number of the committee will be selected in the same way as Revenue Zaildárs, that is to say, with regard to the votes of the village headmen as well as to personal claims, and one-third may be appointed without taking votes. The duties of the committee-men are to supervise the clearances of the canals, to keep a record of the laborers present at the work, and to help the Canal Officer generally in all matters connected with the administration of the canals. They are renumerated by a remission of *cher* labor due on account of their own land irrigated by the canals. Each irrigator is bound to furnish labor at the place and time intimated to him, and if he fails to do so he is liable to pay a commutation fee of 8 annas per man per diem. These fees are credited to a canal fund known as the *Zar-i-nágha* Fund, from the proceeds of which works for the improvement of the canals, but not original works, may be undertaken. Any irrigator can appeal against his assessment to *cher* labor, and may petition for remission of land revenue due to the canals when the canals have failed to work. If the number of laborers called out in the first instance is not sufficient to complete the work of clearance, a further levy of laborers may be made, but in that case the laborers called out are paid 4 annas per diem. Special calls for laborers may be made without payment on occasions of urgency during the irrigating season. It is not necessary perhaps to add more on the subject of *cher* labor in the present review. The whole facts of the case as regards the Mooltan district were reported to the Government of India in 1879, and in the letter of the Department of Home, Revenue aud Agriculture, No. 408, dated 19th August of that year, the conclusion was accepted that the system was one peculiarily suited to the circumstances of the Punjab, and that it was most desirable to continue it, provided precautions were taken to prevent the recurrence of certain abuses which had crept into the working of the system in the past. The *cher* rules of the Mooltan district have since been formally approved by the Government of India. The rules for the Muzaffargarh district are based mainly upon these, but they have not hitherto been submitted to the Supreme Government. The reason of this is that there is much in the rules which was new as …

Muzaffargarh, and it was considered advisable that they should be worked experimentally before they were formally sanctioned. The rules have been accepted by the land-owners and irrigators of the district, and an entry has been made in the administration paper of each village by which the people have bound themselves to observe the conditions of them. The present settlement will accordingly be sanctioned subject to the observance of the above engagements.—(*Punjab Government's Review of the Muzaffargarh Settlement Report*).

II.

Papers as to Inundation Canals in the Dera Ghazi Khan District.

CHAPTER X.

IRRIGATION CANALS AND OTHER IMPORTANT SOURCES OF IRRIGATION.

Sources of irrigation.

152. The lands of this district without irrigation, whether by canals, hill streams or wells, are unproductive. The rainfall alone would not suffice to mature any crop whatever. To supply the place of the rain, which the climate of the district denies, the abundant waters of the river Indus are at hand on one side of the district, and on the other the superfluous rainfall of the hills can be utilized without any considerable engineering difficulties.

Inundation Canals.

153. There are fifteen main inundation canals which have their heads direct from the river:—

The Massúwah.	Sáhiba.
Fazlwah.	Chibri.
Mánka.	Kiria Gámú.
Kot Dáúd.	Son.
Shoriá.	Núr.
Kastúri.	Dhundi.
Dingána.	Kútab.

Kádra.

The vexed question of the treatment of land irrigated by the thirteen canals out of the above number, which are under the control of Government, has been one of the most difficult which has had to be decided during the course of the present Settlement. The Massúwah and Fazlwah Canals belong to private individuals, by whom they are at present managed. All the remaining canals are managed and controlled by the officers of the Irrigation Department.

Enquiry made into rights in canal.

154. An enquiry made into the respective rights of the people and the State in the inundation canals was ordered in 1870, and an abstract of the report, which contained the result of the enquiries* then made will best serve to explain the complicated canal system of the district.

*Settlement Officer's No. 29 of the 23rd of January 1871.

Manner in which canals were first excavated.

155. The Dera Ghházi Khan district is so arid that in those parts of it which are beyond the reach of hill streams or of river floods some method of irrigation must have been introduced simultaneously with the first attempt at cultivation. Whether canals or wells were first used for irrigation purposes, is not known. There can, however, be little doubt but that canals must have been excavated at a very early date. There are no village communities in the district who would have naturally united to dig canals. The whole of the appropriated land is held in parcels by separated proprietors, and there is no such thing as common land. It therefore fell to the governors of the district to collect the owners of separate estates, and to combine them for the purpose of carrying out the excavation of canals. The first step taken, when the digging of a canal was determined upon, was to collect all the owners of land whose estates would come within the influence of the proposed canal. Each landowner was compelled to excavate a portion of the canal equivalent to the extent of his holding, and if any portion of the land which the canal was intended to irrigate was unowned, it was bestowed … outsider who would come in and take up a share of the … to the share of land allotted to hi…

day assisted, more or less, materially in the excavation of canals by providing food for the laborers whilst engaged on their task, but, whether he assisted materially or not, it was usual for the governor to undertake the direction and supervision of the work of digging the main canal. When the main canal was once dug, the people were left to make branch canals and canal water-courses for themselves, and they were also left to arrange the division of water through panchayats or committees of delegates appointed by themselves; compensation for land taken up for canals was never either demanded or paid. Land, although taken up by a canal, was still held to belong to its original owners, and the banks of the canals were held to be the property of the persons through whose lands the canals passed. Diwan Sáwan Mal was the first to interfere in this matter by prohibiting the cutting of shisham trees on the canal banks without a license.

Canal clearance and the different systems by which the cost of clearance has been levied.

156. The annual canal clearance was done by the whole body of canal irrigators. Each well estate contributed the labor of one man called "cher" and each banjar estate, or estate without a well, the labor of half a man. This system continued until Diwan Sáwan Mal's time. Diwan Sáwan Mal introduced the "hassil cher" system, under which the canal clearance was undertaken by government in consideration of the payment of a certain rate. This system, in different forms, has been continued down to the present day, the government having been responsible for the canal clearance, reimbursing itself by the levy of rates or of a commutation for rates. The mode in which these rates should be levied was the subject of considerable controversy, of which the details will be found in the chapter which treats of the assessment.

Are the inundation canals Government canals.

157. The canal clearance question has been satisfactorily settled, but there has been another question of equal, if not of greater, importance raised in connection with the inundation canals of the district, and this question is as to how far these canals can be considered Government canals.

Alterations in the canal system.

158. The management and control of the irrigation canals has always rested with the government of the day, and was accordingly assumed by the British Government at annexation. Under native governments little or no interference was ever made with the distribution of canal water, and alterations were never introduced into the system of a canal by which the course of irrigation was changed, or irrigation taken from some lands and supplied to others. Since the Canal Department has assumed charge of the canals it has held that the canal water should be supplied in such a way as to irrigate the largest possible area, and, in pursuance of this policy, alterations have been made in the canal system, which, although beneficial on the whole, have been prejudicial to the rights of old irrigators, and have been looked upon as an invasion of vested interests. I will give an instance of what occurred on the Manka Canal to show why these alterations were distasteful to the people.

The Mánka Canal extension.

159. In 1863 the Manka Canal was extended so as to supply the Leghari villages at the tail of the canal. Government paid Rs. 29,000 towards this extension, and Jamal Khan, the Leghari Tumandar, contributed an equivalent sum. The canal was lengthened for 12 miles. When the extension was completed, it was found that the head of the canal would not carry enough water to provide the increased irrigation for which the canal had been extended. Four branches of the Manka, the Wang, the Shoria Kot Chutawala, the Dhori, and the Lunda, were then shut off from the Manka Canal, and the water they used to receive was sent down to irrigate new lands at the tail of the canal. The Wang and the Shoria Kot Chutawala Branch Canals were now supplied from the Shoria Shambewala canal. The Shoria Kot Chutawala Branch retained a head from the Manka Canal, from which it was to be supplied in case of failure of supply from the Shoria Shambewala Canal. The Dhori Branch Canal was tailed into the Fazlwah private canal, the owner of which need not supply the Dhori with water unless he likes. The Dhori, however, retained a subsidiary head from the Manka Canal. The Lunda Branch Canal was closed altogether, on the grounds that it

did not repay the cost of its maintenance. The Shoria Shambewala Canal had now two additional branches to supply, so nine villages at the head of that canal were told to dig canals for themselves from the river, as they would no longer receive water from the Shoria Shambewala. They dug three small canals, only one of which is now in existence. One was taken up for a fresh alignment of the Shoria Shambewala Canal in 1868. This was the Kiria Khawar Canal, for the damage done to which compensation was awarded when the Lieutenant-Governor visited the district at the end of 1873. The other failed to work, and was again made a branch of the Shoria Shambewala. The third is still in use but it does not flow well.

It will easily be imagined that the irrigators whose supply of water was stopped, or to whom a substituted supply was given consequent on the extension of the Manka Canal, would fail to see the justice of a measure by which they were made to suffer for the good of others. When it is remembered that these men or their ancestors shared in the original excavation of the Manka Canal, and had ever since shared in its annual clearance, it is no wonder that they should have been discontented when they found themselves shut off from a canal in which they looked upon themselves as having vested interests.

Canal Conference held in February 1871.

160. In February 1871 the Lieutenant-Governor visited Dera Gházi Khan, and directed that all claims to compensation for injuries due to alterations of canals should be heard by the Settlement Officer, and that compensation should be awarded where necessary. Compensation was awarded in the Kiria Khawar case, but in other cases it would have been very difficult properly to appraise the injury done. The Shoria Shambewala Canal has much improved during the last four years, so that the villages transferred to it have not a less area irrigated now than they had in 1863. The real loss occurred in the years which immediately succeeded the Manka Canal extension, and it cannot now be ascertained. At the Conference under discussion the Lieutenant-Governor finally decided, after consulting with officers of experience and local knowledge, that there was no reason to doubt the powers of the Government to assume, as it had done, the direct management of the Dera Ghází Khan canals. That the Government had a perfect right to manage the canals is certain, and it is now admitted that the Government in the management of the canals is bound to continue a supply of water, as far as lies in its power, to lands which are already irrigated; also that in cases where the supply of water from a canal may be cut off by the arbitrary act of a Canal Officer, even though it be for the advantage of the community at large, the injured party must be compensated. No more can, in my opinion, be fairly demanded.

Records of rights in canal prepared at the present Settlement.

161. Careful records of all rights of irrigation have been prepared under the orders of Government at the present Settlement. Every field which was irrigated at Settlement has been shown in a separate map, which has been made to show all the lands irrigated on each canal; every field has also been entered in a register. I trust that these registers will prevent many disputes in future.

The Canal Act VIII of 1873.

162. The Canal Act VIII of 1873 has now been passed, and the Honorable the Lieutenant-Governor has resolved that, while it is essential that the executive administration of the canals should rest primarily with the officers of the Canal Department, it is, at the same time expedient, under the peculiar circumstances of the District of Dera Ghází Khan, that the District Officer should possess greater power of control over the proceedings of Canal Officers than is necessary elsewhere. He thinks, however, that the requirements of the case will be sufficiently met by providing that, *quá* the Dera Ghází Khan district, the Deputy Commissioner, and not the Commissioner, shall exercise the appellate powers referred to in Sections 32 (*b*), 33 and 34 of the Canal Act. This arrangement will enable the District Officer promptly to correct erroneous or objectionable orders of the Canal Officer, and at the same time leave the executive administration of the canal primarily in the hands of the department responsible.

616.

163. In the Pachád the hill streams are even more valuable to the people than are the canals in the Sindh. In the Sindh wells can be used. In the Pachád the depth at which the springs lie precludes the use of wells for irrigation. Cultivation is carried on entirely by the water of hill streams. The largest of these streams are the Kahá, which enters the plains opposite Harrand, and the Sangarh, which comes down from the plains near Mangrota. The Vador stream, which is called after Vador, a village about 12 miles from Dera Gházi Khan, and the Sori streams, which waters the lands of the Lúnd Túman, are the next in importance.

Hill streams.

164. The Kahá and Sangarh streams are the only ones which have any perennial flow, and this perennial flow does not extend for many miles from the gorges through which they enter the plains. The Kahá water reaches to Muhammadpur about 14 miles from where it leaves the hills, and is carried on to Dájal, a distance of 28 miles, but only suffices to provide drinking water to that town. The Sangarh perennial water only reaches some ten miles. The remaining hill streams of the district only run after rains in the hills. When the rain in the hills is very heavy, they come down very suddenly and with great velocity. The larger hill streams are called "nain," and the smaller "larih" "chúr," and "parah."

Perennial streams.

165. On every stream there is a net-work of distributaries, which are generally called after those who excavated them. Thus the Lisháriwah is the distributary of the Lishári section of the Gúrcháni tribe. To supply water to these distributaries a dam is placed in the main stream, and as each successive distributary is supplied, its dam is broken down. These dams are made of earth and stones bound together with the boughs of trees and with bushes, and are erected in the order in which the distributaries leave the main stream. If the distributaries are at a low level dams are not required, but few distributaries are at so low a level as to be capable of being supplied without dams. These dams are not always built so as to check the course of a stream; sometimes they merely turn the course of a stream without arresting it. There are two kinds of main distributaries, one is called "tror," and has no right to water unless the dam which is placed to prevent water from entering it bursts. These are the low level natural distributaries, which would absorb all the waters of the stream if left open. The other is called "wah," and has a right to water in its turn.

Distributaries.

166. On every distributary there are one or more bánds or fields surrounded with earthen embankments made to retain water. These bánds have each a right to irrigation for a fixed period. The mouth of the bánd where the water enters it is called "vat," and each bánd has a "vakra" or small channel down which water is turned from the main distributary by means of a dam. Amongst bánds, as amongst distributaries, irrigation is from head to tail, and the bánds are irrigated consecutively.

System of irrigating bánds or embanked fields.

167. The hill stream water is mixed with a fertilizing silt washed down from the hills. By filling a bánd to the top of its embankments, and letting the silt settle before running out the water, a greedy zamindár can benefit his own bánd to the detriment of the bánd to which his water has to pass. A bánd so treated is called "matáyá."

Silt deposit of hill streams.

168. When a bánd has been irrigated and the water let off, it is sown broadcast, and the seed is then ploughed in. The crop is then left to come up. In a bánd which has a tenacious soil, one thorough soaking will produce a crop, but usually two waterings, or, if possible, three are required. When the hill streams come down between the middle of May and the end of August, kharif crops are sown. If rain does not come till September or October, wheat or mustard are grown. Rabí crops do not succeed in the Pachád unless there is rain in the winter. If a bánd bears one good crop in four or five years, the average is considered a good one.

System of cultivating bands.

169. "Dagar" lands are those which are irrigated not by hill streams but by the drainage of low sand hills; cultivation in "Dagar" land is very precarious.

"Dagar" land.

617.

170. Múnd bánds are those at the head of a hill stream which are irrigated first. "Pánd" bánds are those at the tail of the streams. The "Pánd" bánds are not often irrigated. If the streams come down in great force, they sweep away the embankments of both "Múnd" and "Pánd" bánds, and if the streams come down with slight force, the water does not reach the "Pánd." A project of regulating the hill streams by means of masonry dams and sluices has been suggested by the Superintending Engineer of Irrigation, and plans have been suggested for the control of the Kahá stream. I believe that it would be feasible to control some of the hill streams.

Múnd and Pánd bánds.

171. The hill streams are at present managed by "mamárs" appointed by the people themselves. In cases of disputes or where Government interference is necessary, the Tahsíldárs are held to be the responsible officers. There is some complaint of oppression by the more powerful zamíndárs, who appropriate to themselves a larger share of water than they have a fair claim to. All rights of irrigation in hill streams have now been recorded, but many of the irrigators are anxious to have Government Dárogahs appointed to manage the hill streams. The duties of these Dárogahs would be to see that the rights entered in the hill stream record were respected, to settle disputes regarding the distribution of water, to superintend the clearing of channels and the repair of dams. A Dárogah to be worth any thing must be a man of character and local knowledge, and should receive not less than Rs. 50 per mensem. The appointment of Dárogahs to manage some of the hill streams will be recommended.

Management of hill streams.

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356. Before entering upon the discussion of my proposed assessments, and of the manner in which I elicited them, I will describe the various methods of assessing canal irrigated lands which were proposed for this district.

Method of assessing canal-irrigated lands.

357. Hitherto the assessment of the district had been a fixed one, and in addition to it a certain sum has been charged on account of the half cost of canal clearance. From annexation up to 1857 this half cost of clearance was realized in a fixed sum with the jama. The sum was calculated from the average collections made on this account by the Sikhs, and called "Hasíl Cher" or communtation for the labor of canal clearance.

Half cost of clearance.

358. The sum realized by the Sikhs was one rupee per "pat" on grain, one rupee per maund on indigo, and a few annas per bigha on cotton and other cultivation. This cess is said to have been sufficient to cover nearly, if not quite, the whole cost of canal clearance under the Sikhs. Whether the "Hasíl Cher" did or did not cover the cost of clearance, the conditions on which it was levied were that on consideration of receiving it Government should clear the canals by free labor, and bear any extra clearance charges which the rate levied did not suffice to pay. In cases of sudden emergency, such as the bursting of canal banks, or the silting up of a canal head, forced labor might still be resorted to. This was called "Chikar Cher."

Amount realized by the Sikhs as cost of clearance.

359. In 1857 it was found that the fixed sum for which we had commuted the clearance charge did not actually cover half the cost of canal clearance. It was therefore ruled (Secretary to Chief Commissioner's No. 2026 of the 3rd of November 1857) that the people should in future pay half the cost of canal clearance. The letter in which this order was contained further stated that:—"In addition to the above payment, which will be compulsory, no demand on account of water-rate will be made."

Chief Commissioner's order of 1857. The people to pay half the cost of clearance.

360. In 1868 it was found that the method by which the half cost of clearance was realized bore hardly on some irrigators, whilst others escaped paying anything at all. This was owing to a faulty system of collection. The sum to be realized was distributed over the jama. The consequence was that the whole sum was paid by the

The "ábiána" system introduced in 1868.

owners of assessed lands and that the owners of newly-cultivated lands escaped altogether. To remedy this state of things it was determined to realize an acreage clearance rate of four annas per bigah for flow and two annas per bigah for lift irrigation.

[*"Abiána" rates enhanced in 1870.*]

361. In 1870 these rates were raised to 5 annas per bigah for flow and 2½ annas per bigah for lift irrigation, because it was said that the lower rates did not suffice to meet the half cost of clearance.

The Secretary to Government, in his No. 668 of the 19th of October 1870, stated again that the "ábiána" was fixed at an amount which only covered the half cost of clearance.

[*"Abiána" rates again lowered in 1872.*]

362. In 1872 it having been represented that the increased rates of "ábiána" produced a sum considerably in excess of the actual half cost of clearance, the rates were reduced to what they were in 1868 (Secretary to Government, Punjab's No. 113 of the 29th of January 1872, to the Secretary to Financial Commissioner). In his letter reducing the rates the Secretary to Government wrote :—"It was undoubtedly the intention of Government that the rate levied should not be of the nature known as "ábiáná" in the other districts of the Punjab, but it should be solely to meet half the legitimate expense of clearing the inundation canals."

[*Reason why a regular "ábiána rate" is not applied to the district.*]

363. The reason why a rate of the nature known as "ábiána" in other districts of the Punjab should not be levied in this district will, I hope, be clear from my account of the excavation of these canals (Chapter X.) It is that the people have certain interests in the canals which Government has not been unwilling to consider.

[*Government has intended to levy only half the cost of clearance.*]

364. It has, since 1857, been the declared intention of Government to levy only an equivalent for the half cost of clearance from those who use canal water in this district. Since the substitution of an acreage rate for the "Hasil Cher," the intentions of Government have not been properly carried out.

[*Payments made by the people on account of half cost of clearance between 1861 and 1871.*]

365. From a statement furnished me by the Executive Engineer, Indus Canals, I find that for the ten years, 1861-62 to 1871-72, the average cost of canal clearance has been Rs. 59,330. According to the intentions of Government, only one-half of this sum, or Rs. 29,665, should have been realized from the irrigators. As a matter of fact, however, during the same ten years the annual average payment made by the zamíndárs was Rs. 38,175.

[*Annual demand on account of "ábiána" since 1868.*]

366. During the years that "ábiána" has been collected, the actual half cost of clearance, as compared with the "ábiána" collections placed in parallel columns, will show how much the collections have been in excess of the expenditure :—

Year.	*Half the actual cost of clearance, as per Executive Engineer's statement.* Rs.	*Amount of ábiána demand.* Rs.
1868-69	42,997	45,083
1869-70	23,189	52,546
1871-72	31,538	85,047
1872-73	59,047	71,846
1873-74	61,820	

The large sums expended on canal clearance in the years 1872-73 and 1873-74 were due to the failure of the Dhingana Canal, which necessitated a new head being cut for it in both years, the river having receded from the previous head. The Manka and Shoria Canals were also widened, and in the first of the two years a new head had to be cut to the Kastúri Canal.

[*Objections of the irrigators to the present system.*]

367. The irrigators complaind loudly of the excessive demand made from them on account of water-rate, and declared that they were in reality, though not in name, paying an "ábiána" of the same description as the "ábiána" paid in other districts of the Punjab.

Besides this the people strongly objected to having to submit to annual measurements made with a view to determine the "ábiána" demand. Annual measurements, however fairly made, were considered by the people an infliction, and the annual measurements, which were made by a temporary establishment entertained for the purpose by the Canal Department, were said to be made use of by the measurers for purposes of extortion.

[*Proposed method of assessing the canal-irrigated lands of this district.*]

368. The Financial Commissioner suggested to the Settlement Commissioner the feasibility of introducing into the Dera Ghází Khan district the method of assessing canal-irrigated lands which has been introduced into the Dípalpur tahsíl of the Montgomery district. He proposed that the half cost of canal clearance should be included in the land revenue, and that it should be shown as a matter of account what proportion of the land revenue was due to land revenue proper, and what to canals. The Financial Commissioner proposed that this consolidated revenue should be realized by an acreage rate, and that annual measurements should be made to ascertain the area irrigated. This seemed to the Financial Commissioner the only way of realizing a full revenue without risk of breaking down the villages.

The people met this proposeal with strong objections. They disliked the idea of annual measurements and fluctuating assessments. To meet these objections the Settlement Commissioner suggested that if the share of revenue due to wells and to baráni or unirrigated cultivation were shown separately from the share due to canals, annual measurements would not be necessary, as in case of proved failure of canals that proportion of land revenue which was due to canals might be remitted.

[*Objections to methods of assessments proposed.*]

369. There is no baráni cultivation strictly so called in the Chahi-nahri circles. The only cultivation that could be so classed is either "sailáb" or "rod kohi," which two descriptions of land are influenced by river and hill stream irrigation respectively. It would on this account have been necessary to assume a baráni rate, and it was difficult to apportion the share of land revenue due to canal irrigation separately from that due to well irrigation. Besides this the people were, as I have said, opposed to annual measurements, and it was doubtful whether the existing district, tahsíl, and patwári establishment could undertake extra labor which would be devolved upon them by a system which would render one-third of the cultivated area of the district, upon which half the total land revenue is dependent, liable to annual measurements. These considerations led me to adhere to the existing system of fixed assessment, and the Settlement Commissioner was, after consideration, of the same opinion. I further proposed to fix the charge on account of the half cost of canal clearance, and include it in the land revenue for the term of Settlement.

[*Plan of assessment adopted for canal irrigated lands.*]

370. When the Officiating Financial Commissioner, Mr. Melvill, visited this district in February and March 1873, in order to review my proposed assessments, he, after consulting the Commissioner of the Division, the Settlement Commissioner, the Deputy Commissioner, the Canal Officers, and myself came to the conclusion that the method of fixed assessments was the best suited to this district. This was the opinion of all the civil officers consulted, but not of the two Canal Officers. The Local Government at first refused to accept a fixed annual sum for clearance charges, or to sanction the discontinuance of annual measurements for the purpose of levying an acreage rate for providing half the cost of clearance; but finally it was resolved by His Honor the Lieutenant-Governor, when he visited the district in December 1873, that a lump sum of Rs. 45,000 per annum should be assessed and collected over and above the land revenue, and accepted in lieu of an acreage rate. The amount of the fixed half clearance charge should be subject to reconsideration at the end of five years. Measurements of the canal-irrigated area should still, it was resolved, be made annually for statistical purposes, but they should be carried out by patwárís if fitted for the duty. The sum of Rs. 3,000 per annum, which the Canal Department had previously expended on measurements, is now to be distributed amongst the patwárís as an additional allowance.

371. A system of fixed assessments has now been sanctioned. A portion of the revenue derived from canal-irrigated lands has been assigned to the Canal Department as a matter of account. The cultivation of Chahi-nahri lands does not altogether depend upon canals, as rabi crops can be raised by well irrigation. The cultivation of "banjri" lands depends solely upon canal irrigation. Two-thirds of the revenue of Chahi-nahri lands and the whole of the revenue of the "banjri" lands have accordingly been credited to the Canal Department in addition to the Rs. 45,000 which represent the half cost of clearance.

Part of the revenue of canal-irrigated lands credited to the Irrigation Department.

372. A project for a new canal is now under discussion. Provision has therefore been made, at the Officiating Financial Commissioner's recommendation, for the assessment of lands newly irrigated during the term of Settlement. "Should a new canal be projected and made by Government during the term of Settlement, there can," wrote the Officiating Financial Commissioner, "be no hesitation in saying that it should be brought under the full operation of the Canal Act, occupier's and owner's rates being levied as on other canals made by the Government. Should the capacity of an existing canal be increased by Government, and irrigation be thereby extended to lands not now receiving irrigation, then I would recommend that such lands be assessed at irrigated rates for the remainder of the term of the Settlement; but I would deprecate any attempt to levy any additional revenue on account of water taken from existing canals of which the capacity is not increased by Government to land which was not irrigated at the time of Settlement measurement, such land being in a village of which a part was irrigated at the Settlement. Should water be conveyed from one of the present canals to a village, no portion of which was irrigated at the time of the Settlement measurement, I recommend that the lands irrigated thereby shall be assessed at irrigation rates for the residue of the currency of the Settlement. In short, the only circumstances under which I would advocate periodical measurements are when a new canal has been constructed by Government at its own expense."

Assessment of lands newly irrigated from canals during the term of Settlement.

The Officiating Financial Commissioner's recommendation was acceded to by the Government; and when the Lieutenant-Governor visited the district, I was directed to draw up a memorandum for the future guidance of officers in assessing lands of villages not now irrigated, but which may hereafter be irrigated from existing canals.

373. After considering the revenue rates, and comparing them with the rates actually applied, I drew out the subjoined average rates to be used in assessing lands of villages unirrigated at Settlement, to which irrigation may be extended during the term of Settlement :—

Rates to be used in assessing lands of villages unirrigated at Settlement to which irrigation may be extended during the term of Settlement.

In the Chahi-nahri circles throughout the district—

For Cháhi-nahri lands Re. 1 12 per acre.
For banjri lands „ 1 4 „

In the Sailáb circles throughout the district—

For Cháhi-nahri lands Re. 1 12 per acre.
For banjri lands „ 1 8 „

Banjri lands in the Sailáb circles do not require as many fallows as the banjri lands in other circles, because they are assisted by deposits from the river.

In the Danda circles throughout the district—

Cháhi-nahri lands Re. 1 8 per acre.
Banjri lands „ 1 0 „

In the Pachád circles throughout the district—

Chahi-nahri lands Re. 1 4 per acre.
Banjri lands „ 0 12 „

The rates for the Gharkáb circle in the Rájanpur tahsíl should be the same as those of the Cháhi-nahri circles.

In the Nahri circles of Rájanpur, which consists of poor lands, the Pachád rate should be followed.

For irrigation by lift, and for rabi irrigation, the charges should be half the above rates. The rates proposed are inclusive of clearance charges.

373 *a*. The Lieutenant-Governor, in his Secretary's No. 55 of the 13th January 1875, to the address of the Secretary to Financial Commissioner, sanctioned a uniform rate, as proposed by the Financial Commissioner, for both cháhi-nahri and banjri lands as follows :—

Circle.	*Rate.* Rs.	A.	P.
Cháhi-nahri	0	12	0
Sailáb	1	0	0
Danda	0	10	0
Gharkáb	0	12	0
Nahri, Rájanpur	0	8	0
Pachád	0	8	0

These rates are to be exclusive of, and not inclusive of, clearance charges. Certain rules have also been issued by His Honor the Lieutenant-Governor in the Irrigation Department on the 14th of August 1874, by which, if the supply of canal water to any village is increased at the cost of Government by the construction of new channels, or the re-opening of old ones, such supply will be given, on the understanding that the villagers agree to pay for the increased irrigation at irrigated rates, and unless the people undertake to clear such channels themselves, clearance rates will be charged for clearance by the Canal Department—(*Fryer's Settlement Report of the Dera Ghází Khan district Chapter X., pages* 123—128.)

* * * * * * *

10. The tenth chapter describes the sources of irrigation, of which the most important are the Inundation Canals from the Indus. The Massuwah and Fázilwah, which Mr. Fryer mentions as at present owned and managed by private individuals, were excavated in 1861, 1862, and 1863 under the auspices of the then Deputy Commissioner Major Minchin, who gave a great impetus to projects of the kind. Three or four other canals were excavated or extended about the same time by other parties, some of whom collect "Anwánda" or water-rent from the irrigators, but the management of the canals is in the hands of the Canal Officer. Some of these projects proved very profitable to the projectors, others were financial failures. Government has recently decided to buy out the rights of the present holders of these privately-constructed canals, and has directed certain offers to be made to them for the purpose. The general policy of Major Minchin's concessions was to grant to the excavators, in return for their outlay, first, the ownership of unclaimed waste lands adjacent to the new canals; secondly, exemption from assessment of such lands for a term of years; thirdly, the right to levy "Anwánda" or water-rent in kind from landowners using the water of the new canal on lands previously cultivated and assessed; fourthly, the right to levy for the same term, in addition to such water-rent, an equivalent to the land revenue in kind on lands brought into cultivation by the new canal, and previously uncultivated and unassessed (in other words an assignment of the Revenue of such lands).

It was originally intended that the management of these canals should rest with the excavators till the end of the revenue-free term, and should then pass to Government, but, as mentioned above, all but two are already managed by the Canal Officers.

Whether the payment of water-rent to the excavators would cease after Government assumed the management was a point as to which (except in the case of the Massuwah) nothing was said in the deeds containing the terms of the concessions, and no clear understanding existed in the minds of the excavators; but Colonel Minchin has lately explained that in making the concessions he understood that the right to demand water-rent would be permanent.

In respect to the old canals made before annexation, I think the dispu[te] whether they ought to be called Government canals was t[...]

of words; the real part of it may, I think, be summed up in the two following questions:—

(1). In the case of land which has been always irrigated by one of these old canals, if the Canal Officer permanently stops and reduces the supply by an alteration, not made of necessity for maintenance, but made for the general improvement or extension of the canal, then can the owner of the land claim compensation or only remission of canal charges under Clause (*b*), Section 32, of the Canal Act?

(2). Is Government at liberty to charge an occupier's rate not of the nature of the half clearances charge hitherto collected, or has it in any way pledged itself not to demand more than Land Revenue at ordinary half assets rates (which includes owner's rate), plus half cost of clearance?

The first question was, according to Mr. Fryer, decided in favor of the landowners.

In respect to the second, His Honor the Lieutenant-Governor decided that no pledge had been given. This is undoubtedly true; but looking to the origin of these canals, and to the fact that hitherto the irrigators have paid nothing in addition to Land Revenue, except half cost of clearance, it is, I think, improbable that Government will ever see fit to change its policy and make a larger demand. The idea which prevails in the district, that the cost of clearance and maintenance ought to be borne half by Government and half by the people, is traceable to the arrangement made by Diwan Sáwan Mal, the Sikh Governor, when he abolished the *cher* system and undertook to clear the canals by free-paid labor. In imposing certain rates on produce in lieu of *cher* labor, he gave out that they were intended to cover only half cost of clearance, and that the other half would be paid by the State. At first these rates did only cover about half cost, but by good management they eventually covered nearly the whole. Nevertheless the idea that the Government had undertaken to pay half remained in people's minds, and led to adoption of the rule by our Government at annexation and subsequently.

Apropos of paras. 158 and 159, I think it hardly fair to quote the arbitrary diversions of canal water made in the interest of the Manka extension as an instance of the policy of the Canal Department. It was the Deputy Commissioner who started the project, and what was done by Mr. Kirwan in carrying it out, was not done in pursuance of any departmental policy, or in obedience to any departmental orders, but in the interest of the chief of the Legharis.—(*Settlement Commissioner's Review of Dera Ghází Khan Settlement Report.*)

I.

Papers as to Inundation Canals in the Ferozepore District.

Inundation Canals under private management.

The Inundation Canals.

Captain (now Lieutenant-Colonel) Grey, on assuming charge of Ferozepur on 17th March 1874, made a long tour in the district at once, in the course of which he found that the annual rain-fall (really about 15 inches), while amply adequate, if seasonable, for the light soils of the old bank of the Sutlej, was not sufficient for cultivation on the superior soil of the strip (of some 15 miles' average width) which intervenes between the old and the present course of the river. Thus it was found that much more than a *lakh* of acres of land in this district yielded little or nothing for want of irrigation. In order, therefore, to give the people some knowledge of the practices and advantages of irrigation, Captain Grey obtained permission of the Commissioner of Lahore, in May 1874, to make some small works at once; and in the middle of May two surveyors, lent by Mr. Barnes, Superintendent of Irrigation, Baháwalpur State, arrived in the district, to survey the canal cuts, and most of the works were completed by the end of June. There

were seven canal cuts, of a total length of 52 miles, which irrigated during the same hot weather 6,535 acres for the first time.

In October 1874, Mr. Barnes, who had just returned from England and was on his way to rejoin his post at Baháwalpur, examined, at the request of Captain Grey, all the schemes and surveys that the latter had got ready in the meanwhile. In November the scheme was submitted to the Financial Commissioner, with a proposal that half the work should be done with district grants and the other half by the people themselves, who obtained *takávi* for such works as they could not complete themselves by hand labour in time. On the 1st January 1875, operations were commenced with money borrowed in anticipation of the District Fund grants. The work of excavation was allotted in portions or *duks* to the people in proportion to their lands that were subsequently irrigated. Before the works commenced complete calculations were worked out for the canals, of cubic contents of excavation peg by peg (of 330 feet each), with width and depth at each peg, and similarly for all dams and embankments. The entire length of the canals was then laid out on the ground, and all *bands* set up. It was arranged by the Tahsíldárs and the zamíndárs of the villages concerned that the lands taken up by the canals should be made good to the owners out of the common land of the villages. The Nawáb of Mamdot, Jalál-ud-din Khan (now dead), paid for the excavation of the canals which the present young Nawáb owns in his own *iláka*. An arrangement has been recorded between him and the zamíndárs when the canal does not pass through his own land, that the owners of land taken up by the canal shall receive water for these remaining lands free. The Tahsíldárs were then left to work each on his own method without interference, though the district officers were constantly moving about to guide the people. The result was that the following canals were constructed:—

	Canals.		Length in miles.
Zira tahsíl	3		119½
Ferozepore tahsíl	4		75½
Muktsar tahsíl	3		62
Total	10	Total ..	256½

The first canal was Aghávah (named after Agha Muhammad, the then Tahsíldár of Zira); it was taken out from the Sutlej near the border of the Ludhiána district; and the last, Buggewah, ended on the border of the Sirsa district. All the above canals were ready and commenced to run in the beginning of the hot weather of 1875. The statement on the opposite page gives full details as to cost and results achieved from year to year from the beginning up to 1883.

It should here be recorded that, from 1877 to 1880, the canals failed, inasmuch as they were neglected more or less, and no original works were done. On coming again to Ferozepore, in November 1880, Colonel Grey, finding that the canals did not work satisfactorily in his absence, applied to Government for a special establishment, to be paid out of a small *báchh*, or rate, levied on irrigated acreage. The Sirhind Canal navigation channel having cut across some of the canals, the old Barneswah had to be abandoned, and the new Barneswah, designed and constructed in 1881-82, and a new canal, namely Qutabwah, was added in the Mamdot *iláka*; hence the difference in number of the canals stated above and in the accompanying statement. Lately a syphon drain has been constructed, under the sanction of Government, by the authorities of the Sirhind Canal for the benefit of the zamíndárs, the majority of whom have agreed to pay the cost by instalments. And with a view to bring water this side of the navigation channel, the old Mayawah has been remodelled.

624.

STATEMENT SHOWING COST AND RESULT OF FEROZEPORE INUNDATION CANALS FOR EIGHT YEARS.

1	2	3	4	5	6	7	8	9	10	18	12	13	14	15	16	17	18
No.	Name of Canal.	Length in miles with main branches	Bottom breadth.	Cost of Original Works.			Cost of Clearance, including Establishment Expenses.			Total cost Rupees.	Acreage irrigated.						Total acreage.
				3 years. 1874-77.	2 years. 1877-80.	3 years. 1880-83.	3 years. 1874-77.	2 years. 1877-80.	3 years. 1880-83.		1 year. 1875-76.	1 year. 1876-77.	3 years. 1877-80.	1 year. 1880-81.	1 year. 1881-82.	1 year. 1882-83.	
1	Aghawah	54	40	11,714	No. work.	20,700	936	About 36,000.	5,129		1,918	5,074	About 220,000.	3,896	8,982	8,055	
2	Dolatwah	55½	40	29,094		7,677	2,882		6,623		5,93[illegible]	4,272		8,751	8,557	7,686	
3	*Bacherewah*	79	50	14,996		28,768	1,911		6,293		6,27[illegible]	10,790		13,099	10,207	22,452	
4	Barneswah (old)	60	35	33,452		...	3,162		...		7,33[illegible]	13,585		13,217	14,021	...	
5	*Do.* (*new*)	47	40	...		29.444	...		5,162		...	...		...	...	7,580	
6	*Mayawah*	60½	40	7,544		6,491	500		4,360		1,755	4,000		5,060	5,340	9,191	
7	*Butewah*	16	17½	5,058		1,914	389		1,824		3,436	4,039		4,978	5,583	552	
8	Jalalwah	62	40	17,534	Rs. 3,665 Mamdot Canals.	24,444	1,080		8,317		5,464	8,223		10,577	10,347	12,881	
9	*Nizámwah*	67	40	44,636		4,560	5,655		12,970		6,108	7,294		16,103	12,771	14,615	
10	Khánwah	31½	30	13,749		6,968	84		4,375		...	3,028		1,916	2,379	2,876	
11	Qutabwah	22	30	...		10,102	...		2,782		...	...		...	4,440	2,560	
12	Punjewah	30½	40	21,746		1,601	622		3,575		2,083	4,352		2,280	2,184	2,875	
13	Bagewah	12	10	5,149		...	...		3,913		3,020	...		550	1,323	1,890	
	Total ...	597	...	2,04,672	3,665	1,42,669	18,212	36,000	65,323	4,70,041	43,330	64,657	220,000	80,427	82,240	93,213	583,867

The Sirhind Canal Navigation Channel having cut across some of the canals, the old Barneswah had to be abandoned and a new Barneswah made, and a new canal, namely Qutabwah, was added to the Mamdot *ilaka*; hence the number of canals on this sheet is 13, instead of 10, as per the descriptive statement of canals.

625.

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Proceedings of the Hon'ble the Lieutenant-Governor of the Punjab, in the Revenue Department (Irrigation),—No. 43, dated 6th August 1885.

READ—

A Manual of Construction and Management of District Canals by Lieutenant-Colonel Grey, C.S.I., submitted by the Financial Commissioner under cover of the letter of his Senior Secretary No. 143 of 16th August 1883.

REMARKS.—In the Circular of this Government, No. 316 of 20th September 1882, on the subject of Famine Preventive Works, the attention of District Officers was specially invited to the importance of developing inundation canals. At that time the Extra Assistant Commissioner in charge of Ferozepore canals was engaged, under the direction of Lieutenant-Colonel Grey, in revising the various orders which had been issued from time to time by the latter officer for the guidance of the Revenue staff of the district in the construction and management of inundation canals, and seeing that special interest was likely to be turned to the subject, Colonel Grey offered to throw the compilation into the form of a brief manual for the instruction of Revenue Officers. This offer was accepted by the Financial Commissioner, and the manual under review has accordingly been completed by Colonel Grey.

2. The special thanks of the Lieutenant-Governor are due to Colonel Grey for the trouble which he has taken in this matter, and for the valuable assistance which the manual will be found to afford to all officers in those districts in which the construction of inundation canals can be undertaken and is desirable. The manual is particularly valuable in that it embodies the details of a system which has been worked for 10 years in the Ferozepore district with great success. It is not necessary of course nor is it desirable that the system set forth in it should be followed without modification elsewhere. On the contrary, success in the construction and management of inundation canals must always depend largely on the power of local officers to adapt the details of the system selected by them to the circumstances of the country and the genius of the people. The Ferozepore system has proved very successful in a district of strong village communities, and will probably be found the best to follow in other parts of the Province similarly circumstanced. Where, however, the communal bond is less strong, as in the south-east of the Punjab, a modified form of the "chher" system prevailing in the Mooltan and Muzaffargarh districts will perhaps prove more suitable for adoption. Details of this system will be found in the correspondence on the subject recently circulated by the Financial Commissioner. Where the conditions of native society permit of it the Ferozepore system is preferable in that it affords greater scope for the development of powers of management and combination on the part of the people. But whatever system is adopted must be so framed as to be popular with the irrigators themselves, for, unless the element of popularity is present, continued success in the working of inundation canals must always be problematical.

3. The manual prepared by Colonel Grey will, as already observed, be of the greatest use in assisting District Officers to devise schemes for the construction and management of inundation canals, but no such schemes must be undertaken without the special sanction of Government in each case. Unless the plans and designs of such works are correctly prepared in the first instance, it is impossible that the results looked for can ever be fully attained and it is possible, as has been the case in one or two instances in the Province, that the work may prove a complete failure, and a severe shock be caused to the confidence of the people who may have been inconsiderately induced to undertake it. It is absolutely necessary therefore that the designs for all inundation canals should receive the general approval of Government in the Department of Public Works before the work of excavation is put in hand, and to this rule there can be no exception. Similarly it is necessary that the exact scheme of management, and the precise conditions on which Government will permit water to be taken from the rivers of the Punjab, should be clearly settled in the first place, and should be accepted by the villages concerned with a full knowledge of the whole facts of the case. Unless provision is carefully made beforehand regarding these points misunderstandings are apt to arise, and the people who have been committed to the construction of the canals may not

unnaturally become possessed of the idea that faith has not been fully kept with them. Such provision is particularly necessary where it is proposed to introduce inundation canals into tracts which have been placed under a fluctuating assessment on account of the uncertainty of cultivation and no time can be considered as lost which is spent on carefully maturing schemes for inundation canals before the work of construction is undertaken. As a rule it will be found possible after obtaining the preliminary sanction of Government to prepare designs, to ascertain the willingness of the villagers to combine to give their labour for the work, and to settle the terms as regards both Government and themselves on which such labour should be given, during a single cold weather. The designs and proposals can then be elaborated and submitted to Government for approval and acceptance during the ensuing hot weather, and arrangements can be made for starting the work by the January following when the villagers are most free from field labour. Under ordinary circumstances this will allow of the completion of any work not of an unusual character within 15 months from the time of its conception, and having regard to the important nature of such works as inundation canals, the Lieutenant-Governor does not think that this period can be considered unduly long. In every case it must be definitely settled for what length of time Government will permit the use of water free of charge; when Government will impose a water-rate; what powers of interference in case of disunion among the shareholders shall be exercised by the Deputy Commissioner; what rights Government shall have to take over the canal, with or without payment; and when these rights shall accrue. A statement of the principal remaining points which must be settled beforehand will be found in Appendix I of Colonel Grey's manual.

4. It will often be found that at first starting it is desirable to assist the villagers who have agreed to undertake the construction of an inundation canal either by the grant of takávi or by aid from the District Fund. Under the present Act for the grant of loans for agricultural improvements (Act XIX of 1883) advances can be made to village communities for such purposes, and there is no purpose for which they can be more usefully given than for that under consideration, and for the construction of wells which are always needed to supplement irrigation from inundation canals. As regards money assistance given from District Funds, the Lieutenant-Governor is of opinion that such aid should not ordinarily take the form of an out and out gift. This plan is apt to prove unfair to those payers of the Local Rate whose villages cannot be reached by the canal-water, and in view of the very great profits which invariably accrue from inundation canals when properly constructed there is no reason why the villagers should be treated with special consideration in this matter. When therefore in future assistance towards the construction of such works is given from District Funds, the District Board or Committee should usually acquire an interest in the work, and should gradually recover the sum advanced by it in the form of a light water-rate, to be levied by agreement with the villagers during the period of exemption from payment of such rates to Government. By this means a District Board will be enabled in some cases to undertake a series of useful works by the repeated outlay of one and the same sum, and in all cases will be able to further the completion of at least two public works instead of one alone.

5. The great success which has attended the canals constructed in the Ferozepore district under the directions of Colonel Grey with the advice of Mr. J Barns, late Superintendent of Irrigation in the Baháwalpur State, shows what may be done in this respect by energy and sympathy with the people, provided the designs of the works are in a general way scientifically though roughly correct. This success does not appear to Sir Charles Aitchison to have been adequately recognized so far, and His Honor would therefore wish to take the present opportunity of placing more fully on record the remarkable results which have been obtained under Colonel Grey's system in Ferozepore. The canals, which, including two recently constructed in the Fázilka tahsíl, number 13, and possess a total length of nearly 630 miles of waterway, were for the most part commenced in 1873, and were advanced towards completion in 1874 and 1875. Since then they have been gradually improved and developed, and they now irrigate an area of 120,000 acres lying in the Utár, low lands, which for many

years past have not been reached by the floods of the Sutlej. The area irrigated by the canals since 1874 is shown in the statement annexed to this resolution as far as existing statistics permit.

During the years 1877—1880 the canals suffered somewhat from want of a regular establishment independent of the subordinate Revenue staff of the district, which was no longer able to devote sufficient time to their management, and accordingly a special establishment was created for their working early in 1881. This establishment consists of an Extra Assistant Commissioner as Superintendent, an Assistant Superintendent, a Surveyor, a few Office Clerks, certain officers in charge of the canals of each tahsíl, and a small number of necessary subordinate officials. The total cost of the establishment is Rs. 12,600 per annum, of which one-sixth is paid by the Mamdot estate, in which the canals have been constructed by the Nawáb, and the rest by a cess levied from the irrigating villages. This cess including an item of 6 pie on account of Lambardárs and Patwárís, amounted to 3 annas 3 pie per acre irrigated by flow in 1883-84, and has been reduced to considerably less for the past year. The Mamdot canals have been constructed and maintained at a cost of Rs. 2,50,000, and the direct income derived from them by the Nawáb up to date has been Rs. 1,16,000. This income consists of a water-rate which is levied at 8 annas per acre on lands owned by the Nawáb and at Rs. 2 per acre on other lands. The indirect advantages to the Mamdot estate have, however, been greatly in excess of the direct advantages derived from the canals. By their means a very large area of waste rakh land owned by the Nawáb has now been brought under cultivation, and the income derived by the estate from this source has been no less than Rs. 3,57,000 in the last nine years. The expenditure on the canals constructed by the irrigators themselves cannot be exactly stated, as under the system of management in force the labour of excavation and clearance is given by the people. It has been calculated by Colonel Grey that the capital outlay on the irrigators' own canals between 1875-76 and 1882-83 was about 2½ lakhs of rupees, and that the net additional income derived from the area irrigated during the same period, *viz.*, 424,000 acres was not less than two lakhs of rupees yearly. These estimates are based on very moderate data, and would appear to be well within the mark. Neither on the canals constructed by the Nawáb nor on those dug by the irrigators has a single rupee of Government money been spent. Until the expiry of the present settlement the people are permitted to use the water free of charge; thereafter a light water-rate will be taken in addition to the wet revenue of the land which is now assessed at dry rates only. Meanwhile the people have reaped the money's worth of their labour over and over again, especially in years of partial drought when the crops failed on most of the adjoining unirrigated lands, and the prosperity of the Utar tract which was somewhat on the wane in parts has been completely restored. The result of the work of Colonel Grey and of his assistants in the Ferozepore district is therefore that, without entailing any cost whatever upon Government, an extensive stretch of country has been secured against drought and restored to prosperity, and a net addition will hereafter be made to the Government revenue demand which at the most moderate computation may be put at one lakh of rupees. This is a result of which, in the opinion of Sir Charles Aitchison, any officer in India might well be proud.

6. The Lieutenant-Governor therefore hopes that the success which has been obtained in Ferozepore will encourage officers in other districts favourably situated for the construction of inundation canals to carefully consider the feasibility of the creation of such works, and to use their best efforts to induce the villagers to combine for their execution. In a number of the districts of the Punjab at least much may be done in this way, and, while considerable areas of existing cultivation can be secured against famine, large tracts now lying waste can be brought under crops. Measures have already been adopted by Government with the view of partially obtaining this end by the construction of the Chenáwan, Sidhnai, Para and Lower Sohag Inundation Canals. Much, however, still remains to be done by the people themselves under the guidance of District Officers, and the Lieutenant-Governor would be glad to see a general development of minor inundation canals throughout all areas in the Punjab which are suitable for their construction.

* * *

PART II.—Clearance; Remodelling of Old Works; and Maintenance.

Distribution of labor.

23. In *Part I* the construction of a new work has been considered without reference to the question of the labor by which it is to be constructed. If by paid labor then nothing more is required than to give out the *khuntís* on contract. If, however, the labor is that of the *Abnoshes*, then the method of distribution of new work is the same as that of the yearly clearance; and the same applies to the remodelling of old works. This method is discribed in the next paragraph.

Distribution of labor in yearly clearance.

24. The Náib-Tahsíldár of Irrigation will divide the total cubic contents of work to be done, on any canal, by the total irrigated acreage of the canal with its branches for the irrigation season just closed. The cubic contents of rammed work will be taken for this purpose at double of the figures shown in the *Hisáb Ihdási*, on account of the labor of carrying, dressing and ramming the earth. Similarly, the acreage irrigated by lift whether *jhalár*, *jatha* or *dhingli*, will be taken as half the figure shown in the Patwárí's return, so as to make fair allowance for the labor and cost of lift. The result of the division of cubic contents by acreage, made as above, will be the rate of cubic feet of work, of whatever kind, which falls, on each irrigated acre. This, multiplied by the number of irrigated acres in each *abnosh* village, will give the total task of that village.*

Distribution of labor in new work.

25. When the work is not clearance or remodelling of old works but an entirely new canal or branch canal or *rájbaha*, then, for "irrigated acreage," "irrigable acreage" must be read. This estimate of irrigable acreage must be carefully framed by considering the extent of canal passing through each estate; the lie of the ground of the estate with reference to the line of the canal, and the probable flood level; the proximity and nature of the culturable lands; and so forth.

Hisáb Ihdási of clearance.

26. When the work is "clearance," the cubic contents are arrived at in a manner similar to that for new work. The method is as follows: The heads of all bench-marks are laid bare and the depth of silt thereon is measured; the mean depth of silt on the three bench-marks at each *khúnti* is added to that of those at the next *khúnti*; the mean is again taken, and multiplied by 330 feet, the length of the *khúnti*, which gives the cubic contents for each *khunti*. Then a *Hisáb Ihdási* is framed similar to that for new work.

Re-modelling old work.

27. When the work is re-modelling an old canal, the usual plan will be to take cross-sections at each *khunti*, on which will be laid down the new dimensions. The area of each cross-section within these dimensions will then be calculated, and the mean of two areas, multiplied by the distance of 330 feet, will give the amount of new work in the *khúnti*. Where it is not expedient to undertake the labor of cross-sectioning as above, a sufficient approximation can be obtained from the old longitudinal section. The re-modelled canal can be designed and estimated thereon as an entirely new work of the new dimensions, and then the contents of the existing work, as calculated under the orginal design, will be deducted from the result obtained. To the balance must be added the amount of silt clearance and the result thus finally found of the cubic contents of work to be done in remodelling the canal will be sufficiently correct.

Silt measurements.

28. Heads of bench-marks must be uncovered, and silt thereon measured, by the end of October of each year. The *Hisáb Ihdási* of silt clearance will be prepared by the *Mohtamim*, or officer in charge of each canal, and, after test by the Náib-Tahsíldár of Irrigation, will be sent in by the 15th of November. The Superintendent of Irrigation will then check some of these measurements, the calculations being at the same time verified in his office by the 15th December, by which date all estimates

* Note.—This system of assessment takes no account of amount of water used for the various kinds of crops. Rice takes 6 times as much water as *jowár*, *bájra*, and the lighter *kharif* crops; sugarcane 4 times as much; indigo and cotton 3 times as much. To go into these calculations, however, would rob the system of its simplicity, and this is the *first* requisite for a zemíndári system of irrigation.

of every kind must be ready for submission at the annual audit meeting mentioned in the next paragraph.

Irrigation measurements.

By the 15th of November the Patwárís will also complete the measurements of irrigated area, which will be checked by *Mohtamims* and Naib-Tahsíldárs of Irrigation and surchecked by the the Superintendent before the 15th of December. Thus the irrigated acreage statements will be ready, together with the estimates of work, for presentation before the audit meeting.

Audit Meeting or *Jalsa Báchh*.

29. On the 15th December of each year will be held an Audit Meeting, under presidence of the Deputy Commissioner, called the *Jalsa Báchh*. This will be attended by the representatives of the *Abnoshes* and by the canal officials. All accounts for the past year, prepared as prescribed in Appendix VI, and the estimates for the coming year, will then be passed; arrangements for works and new schemes discussed; the acreage rate of work for each canal assessed, and the expenditure required in the new year, for establishments and other purposes, fixed and distributed over the total irrigated acreage on all canals for the past year by a rate or *bachh*. On these occasions the canal fund accounts must be brought forward and audited. This fund is a Treasury Deposit account to which are credited the proceeds of the yearly *báchh*, grants-in-aid from the District Fund and other sources, and all income of whatever kind. From this fund, all expenditure is paid on cheques signed by the Superintendent of Irrigation. The accounts are kept in day-book and ledger form, and are passed by the Deputy Commissioner monthly.

Commencement of work.

30. All works, whether new canals, re-modelling of old works, or silt clearance, should be well in hand during January. Immediately on the fall of the river, before uncovering the heads of the bench-marks, a *sufficient* dam will have been erected in the mouth of each canal, in view of freshes from the winter rains. This is an absolutely necessary preliminary of work on silt clearance or re-modelling of canals. The *Mohtamim* will report these to be ready by the 15th of October of each year and the Superintendent of Irrigation will visit and pass the dams. It must be borne in mind that insufficiency of dam and consequent swamping of incomplete work, by a fresh of the river, is a frequent cause of, and excuse for, scamping work.

Task statements or *dukbandi*.

31. At the *Jalsa Báchh* the acreage rates of work, for each canal will have been assessed. Task statements or *dukbandís** will then be at once prepared for each canal in accordance with those rates. These *dukbandís* will be *mauzawár*. Each village will be allotted a convenient task or *duk*, being part of a *khúnti* or one or more *khúntís* containing approximately the amount of cubic feet of work which corresponds with the task of that village as obtained under paragraph 24.† If the *duk* is a dam or embankment, or part of such, it will contain, as explained in that paragraph, half the number of cubic feet due under the acreage rate, because rammed work has been entered in the calculations at double its real figure. By a "convenient" *duk* is meant one lying as near as possible to the village concerned. This cannot, however, always be arranged; in which case the village will generally give its *duk* on contract to some other village near which the *duk* lis, frequently also taking on contract the *duk* of some other village similarly convenient to itself. The interior distribution of the work of each *duk* among the *Abnoshes* of the village will be left to private arrangement. Each man knows the acreage rate in cubic feet, the total cubic contents of the *duk*, its value in money, the total irrigated acreage of the village, and the number of his own acres irrigated. Each, therefore, knows the fair share of the task falling to his own lot, and disputes seldom occur. Should they occur, they can be settled by the *Mohtamim* or the Naib-Tahsíldár, or if necessary be referred to the Superintendent of Irrigation.

Mode of performance of *duks* or tasks.

32. When the *dukbandís* have been prepared, and the *duks* allotted, a date should be announced for the completion of the work, and the people will then be left to do it at their own time

* Appendix VII.

† Note.—Much care and thought is required for the *dukbandi*, especially in the case of new work, or of re-modelling old work; not only has the convenience of the *abnosh* village to be considered, but its distance from the *duk* allotted must be allowed for; also the length of 'lead' in that "*khúnti*," and any other local circumstances affecting the distribution of the work. This "*dukbandi*" is an act of arbitration to be performed with the utmost possible fairness, so as to leave no room for grumbling on the part of any *abnosh*.

and in their own way, the canal officials merely urging them from time to time in case of delay. The reeds given for each *khunti*, the *dághbels* laid down, the sections (*dhánchas*) set up for dams and embankments, as described in paragraph 19, will suffice for the guidance of the work. Whether the village does its *duk* by manual labor or gives it out on contract, or undertakes the *duk* of another village on contract, are matters with which the officials have no concern, so long as the work is done thoroughly and to date. Ordinarily it will be seen, in the case of new work at any rate, that on some convenient day the village will march out to its *duk*, *en masse*, with drums beating, and will do the work with a rush. The grey-beards will look on and cheer on the labourers, the young lads will carry baskets of earth, the women will cook the food, while the small children play around and get in everyone's way. Meanwhile the drums beat fitfully, and, the whole thing being regarded as an outing and a *tamásha*, the work will be executed in style. A turban or two and a sack of *gur* come in with much effect on such occasions.

Completion and certificate.

33. After completion, the work will be tested as described in paragraph 20, and the bench-marks laid down, or corrected, according as the work is a new canal or re-modelling of an old work. If the work is silt clearance, the existing bench-marks, with *guniahs* run between them, will afford the test. The completion certificate prescribed in paragraph 22 for the case of new work is equally required for silt clearance, or re-modelling work. In no case must a canal be opened until this has been filed. It is far better that the opening should be delayed, or, if a new work, that it should remain unused even throughout the irrigation season, than that water should be let into an incomplete work.

General directions.

Rat-holes.

Passages or *gháts*.

34. At the time of yearly clearance the revetments (*kirras*) of dams and embankments must be stripped off, rat-holes must be carefully searched for, dug into, well filled up, and tamped, or else filled with liquid mud from a gharra. On all canals passages or *gháts* should be provided at the intersection of every road and path, and by the side of every bridge. These must be renewed at the time of yearly clearance, and temporary bridges repaired.

Cesses or *patris*.

The spoil of clearance must be thrown behind the existing spoil-bank or embankment. In re-modelling canals it may often be necessary to diminish the berm or cess (*patri*), but it should be so arranged that a certain width be always left; otherwise any cutting of the bank will cause the spoil to fall into the canal, or will undermine the embankment.

Directions for dams and embankments.

35. Dams and embankments must either be rammed layer by layer, reducing each foot thickness of earth to 6 inches, or they be constructed with *karahas* (earth-scrapers drawn by bullocks), in which case the dimensions should be half as much again as those given in Appendix III. When it is desired to consolidate the spoil of excavation as an embankment, the loose earth should be saturated, and a herd of cattle driven over it backwards and forwards till consolidated. If possible, *karahas* should be universally used in constructing dams and embankments. There is no method of construction so effectual and safe. They may also be used with much advantage for shallow excavation, under 4 feet depth. Unless the soil is very soft, it has to be ploughed before use of the *karahas*.

Karahas or earth-scrapers.

Position of dams.

In setting out a dam, care should be taken to place it always at least 10 or 15 yards beyond the point where the continuation of the canal leads out of a depression or old channel. Thus a back-water is formed in front of the dam, which speedily fills up with silt, completely securing and indeed masking the dam in a couple of years' time. Embankments are also similarly masked by the deposit of silt on the cesses. On the silt areas thus built up, and on all dams, *farásh* and other trees should be planted, and will thrive wonderfully under such conditions. Spoil-banks and embankments should be similarly sown with *kíkar* seed broadcast.

Tree-planting on dams and embankments.

Care of dams and embankments.

36. Dams and embankments should be carefully watched during the irrigation season till completely masked with silt as above. For the first year gangs of men should relieve each other

in constant readiness, night and day, upon the dams. Subsequently one paid watchman to each dam and important embankments is sufficient. These watchmen will devote *special attention to rat-holes*, and will take care of and water the young trees planted on the dams.

Properly constructed and well watched, no dam or embankment should ever be breached. In case, however, of such an accident happening, the breach should be promptly closed; and this should *under no circumstances* be regarded as impossible.

For closing breaches, three things are necessary before commencing operations:—

(*a*). A sufficient assemblage of hands, with a few drums for encouragement, and a sack of *gur* for refreshment.

(*b*). Plenty of gabions, and masses of brushwood and withies wherewith to make more gabions.

(*c*). Plenty of pointed poles and stakes of various dimensions, ropes to fasten them together, and rammers for driving them and for consolidating the earth behind them. Also mattocks, and carpenters to point stakes and repair rammers and mattock-handles.

Closing breaches.

37. The mode of operations is as follows. First plant the poles across the breach, in a direct or curved line, and in front or behind, as circumstances dictate. The largest pole may be firmly planted in deep water by fastening ropes to its top, floating it to its position, plunging the point down to the bottom and working it in with the ropes held by men on either side of the breach. Having planted the poles (so that one gabion will rest against three poles), and fastened them securely with ropes led from one to the other, and attached to the sides of the breach, then sink the gabions against them, and pitch in earth behind them. Make the work very solid as it advances, beginning from the weakest side of the breach, and pushing the water towards that which is most solid. If there is no choice, or if circumstances so dictate, work from both sides. As the gap contracts and the scour becomes greater, the drums must beat harder till the moment comes for the final effort. Then the business must be done with a rush. Gabion must be piled on gabion till the stream of water is stopped, and behind them earth, brushwood, anything, must be heaped in, pell-mell. At such a crisis it is useful to have sacks ready filled with earth to throw in, but this is costly. Thatches, doors, the sacking which lines carts, can be obtained from the nearest village for use in this final struggle. Everything depends upon checking the rush of water with one effort and then consolidating the bank before it can overcome the check.*

The parties must be carefully told off before commencing operations, each with a responsible man in charge. There should be the earth-diggers, the earth-carriers, the rammers the men for the stakes and ropes, the men with the gabions. The strings of earth-carriers, coming and going should have distinct lines of march so as to prevent jostling. Above all things—and this is the most difficult to secure—till the moment of the last struggle no sound should be heard except the drums and the words of command.

PART III.—Irrigation and Management.

Canal officials and their pay.

38. The management of each canal should be vested in an official called *Mohtamim* or *Dárogha*, aided by three or four *mírábs* (distributors of water), or or more according to the extent of the distributaries. The pay of the *Mohtamims* is ordinarily Rs. 20 per mensem, and they may be selected among the best Patwárís. The pay of the *mírábs* is depended on the irrigated area, as explained in paragraph 40. Over two or three canals should be a superior officer on Rs. 50 per mensem, of the status of a Naib-Tahsíldár; and all these officials on the entire canal system should be under a

* Note—Two lines of stakes and rice straw gradually introduced between then has been found a quick and efficient way of stoping a breach.

Superintendent of Irrigation, on the grade and pay and allowances of an Extra Assistant Commissioner. The Patwárís of the *abnosh* villages are also connect- ed with the Canal Department, inasmuch as they receive pay therefrom, depen- dent upon the irrigated acreage, as explained in paragraph 40.

Duties of officials.

Mohtamims.

39. The special duties of *Mohtamims* have appeared in previous para- graphs. They have to uncover bench marks; measure silt (*att*) and prepare the *Hisab Ihdásis* thereof; supervise work on the canals; check irrigation measurements; take care of dams and embankments; look after the heads of their canals, and search out new heads when required, and also lines for new works—such as heads or distributaries; lay down bench-marks; test work with tape and *guniah*; develop irrigation by causing *Kassis* (irrigation-cuts) to be taken out; align these and supervise their construction; take care that water is not wasted or embankments damaged thereby; arbitrate in the distribution of labor and of water; keep the the canal cesses clear, and the beds free from obstruction; see to the passages (*ghats*) and bridges; and, in short, look after everything connected with their canals. The *mírábs* of the canal are the *Mohtamim's* instruments for all these purposes, each within his special length of main canal, or branch, or rájbaha. These *mírábs* will generally be influential and energetic landholders of the neighbouring *abnosh* villages. The position and dignity afforded by the post goes for part of the remuneration, in addition to the acreage rate of, say, 4 pie per acre.

Naib-Tahsíldárs.

The Náib-Tahsíldárs general- ly supervise and aid the *Mohtamims* in the above duties and specially take charge of the construction of new works or the re-modelling of old works. Both sets of officials works under the

Tahsíldárs.

Tahsíldárs of the sub-divisions in which the canals are situated, subject to the general authority of the Extra Assistant Commis- sioner, Superintendent. The concern of the Tahsíldárs in irrigation matters

Superintendent.

will be more or less according as the Deputy Commissioner permits the Superintendent to delegate authority to them. The Superintendent is the controlling authority of the entire system of canls. He has civil and criminal powers to deal with all disputes arising out of the distribution of the water and the canal management generally. He pays the establishment, and makes all necessary disbarsement by cheques drawn on the Canal Fund. He passes estimates and accounts, and is entirely responsible for them. He prepares the materials for the December audit meeting, (*Jalsa Báchh*), and assists the *ábnoshes* in auditing the accounts of the past and the estimates for the coming year, and in fixing the acreage rates of work for each canal and the *Báchh* for expenses. He will also draw up the irrigation report,

Surveyor, Computor and Superintendent.

to accompanying the annual Revenue Report of the Dis- trict. In the Superintendent's Office there will be a sur- veyor and a computer, who will work under his orders in such manner as he may direct. If the canal system is a very large one, it will be necessary for the Superintendent to have an Assistant. The pay and allowances of these officials will depend upon circumstances and on the extent of the canal system. It should generally be fixd at progressive rates. The surveyor should be a thoroughly qualified and honest leveller, and *nothing more*.

Cost of establishment.

40. The cost of this establishment is paid from the rate fixed at the December *Jolsa Báchh*. This cost and all necessary ex- penses should fall at from 4 annas to 2½ annas per acre irrigated as a *maximum* and *minimum*—some surplus being always arranged for, on the occasion of fixing the *Báchh* rate, as a reserve in the Canal Fund. The remuneration of *Mírábs* and *Patwárís* will be a separate rate on the acreage, generally 4 pie and 2 pie respectively per acre irrigated. The object of this is to give these functionaries a special interest—the *Mírábs* in the extension of irrigation, the *Patwárís* in its correct measurement.

Irrigation channels or *kassis*.

41. No *kassi* can be taken out without the sanction of the Naib-Tahsíl- dár on the report of the *Mohtamim*, who will fix the spot for tapping the canal, and will align the *kassi*. If a large *kassi* of considerable length, it should be levelled by the surveyor, and regular design furnished from the Superintendent's Office. Its mouth must be revetted to prevent enlargement. If taken through an embankment, masonry sl

must be made at the mouth of large *kassis*, and for small ones pipes of a foot and more diameter, specially burnt for the purpose, should be passed through the embankment to supply the water. Great caution must be exercised in taking out *kassis* through large embankments.* When such are thrown into depressions they must not be taken out opposite the depression, but must be led back from the canal at a sharp angle from a point considerably further down the canal. Ordinarily, however, *kassis* should not be thrown into depressions (save at their tails), but carried along irrigating crests.

The provisions regarding taking out *kassis*, and distributing water there- from, are contained in paragraphs 16 and 17 of the *Wajib-ul-arz* (Appendix I) which is executed by all the *ábnosh* villages interested in the canals.

Cultivation of cesses.

As provided in paragraph 3 of that *Wajib-ul-arz* the *Abnoshes* are at liber- ty to cultivate the cesses of the canals, the spoil-banks, when not dressed and consolidated as embankments, and even the beds, with special permission. Ordinarily no obstruction must ever be placed in the bed of a running canal; but for special reasons, *under orders of the Superintendent*, water may temporarily be raised by *chhabs*

Chhabs.

i.e., by inserting stakes and laying brush-wood against them. These must, however, be carefully removed when the object has been attained.

Duties of surveyor.

42. During the irrigation season the surveyor should inspect every canal from time to time, reporting to the Superintendent, who should himself also be constantly on tour. During the winter the surveyor will generally be engaged in levelling new heads, branches, and *rájbahas*, or *kassis* for the *ábnoshes* if desired by them, and on other such work. He may, if not so engaged, be employed with advantage in testing silt measurements and silt clearance.

Water-gauge readings.

At the mouth of each canal there is a water-gauge, as mentioned in paragraph 20, and some person in the nearest village—a patwári or school-master or shop-keeper—should be paid a small allowance to read it daily during the irrigation season, and to send in a weekly statement of the readings. These will be checked by the surveyor in the course of his hot weather inspections, who will report directly to the Superinten- dent the guage reading noted by him on the day that he visits the head of the

Cross-section and mea- surement of velocity.

canal. He will on the same occasion take cross-section and midstream velocity of the canal, and discharges should be calculated therefrom monthly in the Superintendent's Office. The Superinten- dent will thus know the working of every canal throughout the season, and will thus be able to compare irrigated area with discharge and to remedy deficient duty obtained from the supply.

Calculation of discharge.

43. The discharge of a canal on any given date is the area multiplied by the mean velocity. The cross-section taken by the surveyor as above will give the area; and mean velocity (V) can be obtained in multiplying the observed surface velocity (v) by 8.

Thus—

$$V = v \times \cdot 8.$$

If a more accurate calculation is desired, the Tables of Bazin's co-efficients† may be consulted. If the surveyor has not a watch, he should be provided with a sand-glass or a pendulum beating half-seconds. It is his business to know how to measure the velocity of the canal stream; but in case he should not know, instructions are furnished in Appendix II.

Masonry works.

44. If it can possibly be avoided, masonry works should not be undertaken on district canals. They are likely to be a constant cause of trouble, and the necessity for them can generally be evaded by contrivances. This does not, of course, refer to small sluices at the

* NOTE.—Embankments (pascyl), *not dams* (bands), are here referred to. Of course a *kassi* would never be taken through a dam.

†NOTE.—These co-efficients must not be confounded with the co-efficients (c) given in the note to paragraph 3. The co-efficients or ratios of mean to maximum velocity given by Bazin also vary slightly with the hydraulic radius. A few values are given below :—

R.	Co-effit.	R.	Co-effit.	R.	Co-effit.	R.	Co-effit.
1·0	·65	4·0	·75	7·0	·77	10·0	·78
2·0	·71	5·0	·76	8·0	·78	11·0	·79
3·0	·74	6·0	·77	9·0	·78	12·0	·79

heads of *rájbahas* and *kassís*, which it will be wise to construct gradually as required, so as to regulate and economise the expenditure of water. Bridges, too, must be made, but these should be merely abutments and piers, traversed by "trussed beams." Care should be taken not to diminish the waterway, and flooring should be constructed underneath the bridges and wingwalls up and down stream, to permit of their being used as sluices if required. Occasionally it may be unavoidable to put a small "fall" into a canal, so as to keep up the head of water, for the use of certain villages, before losing head in low ground. In this case it will probably be advisable to obtain a design for a "fall" or "rapid" from a scientific Engineer. If such a fall is made near a town, a considerable income can be obtained by setting up water-mills. It may very possibly become necessary to construct aqueducts (called *nisars* or *sandillas*) for carrying *rájbahas*, or branch canals, or tails of main canals, over other canals, in the interest of certain villages whose land it is desired to command. These are very easily made of planks with wooden supports and masonry abutments. It does not in the least matter if their bed is a foot or two below the flood-level of the canal they traverse; only, in that case, the supports must be sunk deep into the bed of that canal on account of probable erosion there. The abutments must be carefully constructed, with wings and flooring carried a few feet up and down the channel of which they form part, and prolonged with brushwood revetment. Similarly the wing walls and flooring of all sluices, and bridges intended to be used as temporary sluices, should be very carefully constructed. Erosion, on all these works should be carefully watched for, and met, if in the bed of the channel, by throwing in nets full of broken brick or slag (*khingar*); if in the sides, by revetting with stakes and brushwood. In all these cases as in those of dams and embankments, watchfulness is required. It is "the stitch in time which saves nine."

The cost of all the works referred to in this paragraph (except bridges), unless paid by the Canal Fund as a special case, will be met by a *báchh* or rate on the irrigated acreage of the villages in whose interest they are constructed.

Conclusion.

45. In conclusion, for the successful construction and management of District Irrigation works, it is indispensable, in the first place, to obtain the hearty co-operation of the local officials and the leading zamíndárs. This secured, constant personal exertion, experience and the guidance afforded by this Manual will ensure success in the creation and conduct of a system of inundation canals in any district possessing the requisite physical conditions. Too much should not be attempted at once, and, till subordinates are trained, it is absolutely necessary that the Deputy Commissioner should see to everything himself. On no account should direction of any kind be left to the surveyor. He should be regarded as merely an instrument for levelling, and it is much if he does this in a reliable manner. Till experience is acquired by all parties, the Deputy Commissioner must do *everything*—select the lines, give the designs on the surveys, check the calculations, lay out the work, arrange its distribution, supervise its performance. Gradually, as his subordinates learn the business, the task will become lighter, but throughout the secret of success is in the master's eye. As far as possible all money transactions with the irrrigators should be avoided. As stated in section 32, it is for them to do the work themselves, or to get it done on payment, but on no account should the officials have anything to say to the latter, which the irrigators should be left to arrange for themselves. Of course if the work is one paid for by a grant-in-aid this does not apply. In that case the value of each length is known to a pie, and when given out on contract there is little room for confusion of accounts or malversation. Finally I strongly recommend the free use of encouragement and rewards in carrying out these schemes. It is wonderful how labor is sweetened by gur; and the effect of cheap paggarís distributed with a little *eclát*—a small Darbár and a few fire-works—is very great with the zamíndárs. As for the officials it is but just that extra exertion should meet with substantial recognition.

APPENDIX I.

Translation of Wájib-ul-arz of the *canal.*

As we zamíndárs of have of our own free will decided on the introduction of the canal

into our limits, we therefore record the following terms as "Wajib-ul-arz," and do hereby agree to conform to them ever hereafter:—

SECTION I.

Regarding rights in the land occupied by canals, and supervision of the canals.

1. We shall make no claim upon Government for compensation or for the value of our village land used for the bed and cesses of the channel and the spoil-banks; moreover, we will not petition Government till settlement for reduction of land-revenue taken up for the above mentioned purposes. If the land is unassessed, then no arrangement is required. If it is assessed land, it will continue its payment as common land in the same *khάta* as usual, or that payment will be added proportionally to the *khátas* of all co-sharers according to their respective ancestral method to plough or *khewat* money, as may be customary in the the village; and will be paid together with our *khewats*. In cases where land of a special *khάta*, co-sharer or occupancy-tenant is taken up, he will be satisfied by the transfer of the common land of the *patti thulla* or village to which he is subordinate, and the land occupied by the canal will be transferred to the *patti thulla*, or village as common land just in the same position as the common land with which it is exchanged. At the time of partition it will be divided, Government having nothing to do with it.

2. If on the occasion of digging the canal, any of our trees or standing crops should fall within its bed, cesses, or the spoil-bank, we shall have no claim on Government for damages so sustained. In case of damage by flood or any other cause, entailing loss on crop cultivation or houses, the aforesaid terms as regards damages will equally apply, because a little loss brings about a great gain; and independently of this it is solely our own doing, and necessarily the profit and loss is ours also.

As soon as the canals get dry we shall be at liberty to cultivate their spoil-banks and cesses or to have them cultivated by cultivators on rent without, however, interfering with the bed of the canal; and if ever we cultivate the bed of the canal, we will only do so with permission. We will take upon ourselves the responsibility of putting down the bench-marks and supplying pegs to the surveyor, at the same time we will hold ourselves responsible for their preservation in our respective boundaries. While ploughing or sowing crops, we will take care to keep off the bench-marks and *burjís* within or without the bed of the canal, so as to ensure their not being injured in any way, and we will avoid bullocks and ploughs doing any injury to the sides.

4. We will plant trees along the sides of the canal and water them therefrom. These and any other produce, *viz.*, reeds and rushes, &c., together with other "*jalkar*" productions, such as fish, *singháras*, &c., or grass raised within the canal of our boundaries, will be our property.

SECTION II.

Excavation.

5. Whatever *duk* of excavation of canal is assigned to us as *ábnoshes* by the Superintendent of Irrigation in proportion to our irrigated area will be done willingly, and we will fully observe the instructions given by the supervising officials regarding the depths, breadth and distance for throwing of earth, as well as other matters connected with the channel.

6. We will continue to carry out the usual clearance every year in the same way as it was executed the first time, *viz.*, whatever *duk* is given to us in proportion to our irrigated area will be done duly.

7. Whatever silt will come out after the usual clearance shall be thrown outside the spoil-banks of the canals.

8. Whatever *bunds* or *paseyls* will be made in our limits will be constructed according to directions and repaired, and we will not cut them without permission, and whoever is charged with their safety will be responsible for the same; that is to say, we, the *ábnoshes*, will guard the bunds and *paseyls* wherever we may be directed to do so, in our respective boundaries, and in case of damage by overflow, we, all the *ábnoshes*, having immediately joined, will repair the injured places, and provide the necessary materials.

9. We will continue to supply proportionately whatever brushwood, &c., pegs and rammers, may be required for the bunds and canals.

10. Should there be any new work needed (such as making bunds, or a new mouth owing to its silting up, or being cut away) for the continuance of the canal, this task will be undertaken by us like the usual clearance; we shall be at liberty to do it by *duks*, by manual labor, or the Superintendent may have it done by taking from us (*ábnoshes*) the required cost according to the proportion of our irrigated area. If the money be borrowed from the District Fund for the purpose, in order to prevent delay, it will be repaid by us to the District Fund according to our respective shares in proportion to the irrigated area.

11. Whatever kind of excavation there may be, it will be executed in the following way, *viz.*, that it will be distributed among *ábnoshes* of every village in proportion to the aggregate contents of excavation and the irrigated area, and a certain period will be fixed in which every *ábnosh* village will make its own necessary arrangements for the *duk*. No officials will ever interfere within the specified time. If the work is not done within the appointed time, the Superintendent of Irrigation will be at liberty to have the work done by paid labor and to realize the cost from the *ábnoshes* concerned by a rate.

12. An Irrigation Department having been formed for the management of our canals, we agree to support it, paying the cost by a rate on irrigated acreage which shall be assessed yearly in December at a meeting of all the *ábnoshes* assembled at a convenient centre.

Section III.

Management.

13. Where a village road goes across the canal, we will make a bridge to pass on or provide some means of passage. We will not change existing roads, nor lay any claim against Government; the public roads of course are to be looked after by Government.

14. We will never attempt to make any bund within the bed of the canal; the Superintendent, however, is at liberty to do so. We will irrigate by means of water-cut, *jhallar*, *jatha* or *dhingli* only; irrigation-cuts will be made in accordance with directions received.

15. Whenever Government should refuse or stop the water-supply, we shall have no claim for compensation or loss of any kind; that is, we will take water during the pleasure of Government.

16. Whenever a mauza *ábnosh* or a single *ábnosh*, whether of our own or the neighbouring *ilaqa*, may be under the necessity of taking water through some other proprietor or proprietors' land, we shall not object to it, nor will dispute among ourselves for damages of land or crop resulting thereby, for we (*ábnoshes*) are equally interested in the matter, as often times an *ábnosh* feels the necessity of taking water through another proprietor's land.

17. In case of a joint cut owned by certain *ábnoshes*, turns will be fixed for them, in accordance with which they will water their respective fields. Any one acting contrary thereto will be liable to fine and compensation for damages done. A memo. of the turns in question will be filed at the Superintendent's Office. If any *ábnosh* shall obstruct such a joint water-cut, and raise water therefrom by some contrivance, prior to his so doing he must obtain the unanimous consent, in writing, of all *ábnoshes*. Without such, no *ábnosh* is authorized to do anything in regard to water, &c.

18. If any *ábnosh* tenders written resignation of a part of the canal, he will forfeit all his rights and past expenses, and shall have no claim of any description and his share, in case of refusal by other *ábnoshes*, may be bought by a third person or an outsider. If some recusant co-sharer's land is irrigated, *abiánah* will be charged thereon, according to the state of the crop and land, and the proceeds will be spent on a common charge.

19. Whatever orders and instructions are issued by Government from time to time will be implicitly obeyed.

20. Any one acting against, or infringing the terms entered in this agreement, or contravening any other orders and directions, will be punishable by Government.

21. We will pay the *Mirab*, appointed by our consent for distributing water, his right of "*choung*," *viz.*, wages at 4 pie per acre of the irrigated area; and similarly 2 pie per acre to the Patwári for measuring irrigated acreage; or at any other rate fixed for the canal like other *ábnoshes*. The water will be used in conformity with the directions received through the *Mirab* from the Superintendent.

22. Further we beg to aver that we have thoroughly understood the contents of this agreement written in the form of *wájib-ul-urz*, and we unanimously agree to be ever bound by it. If any of us does anything contrary to the terms laid down herein, the Superintendent is authorized to prosecute him on behalf of all *ábnoshes* for the damages resulting to the canal.

J.

Papers as to Private Inundation Canals in Shahpur.

No. 774, dated Lahore, 10th July 1885.

From—R. G. Thomson, Esquire, Offg. Senior Secretary to Financial Commissioner, Punjab,

To—The Offg. Junior Secretary to Government, Punjab.

1. Commissioner Ráwalpindi's No. 349 of 2nd September 1884, with enclosures.
2. Commissioner Ráwalpindi's No. 420 of 21st October 1884, with enclosures.

With reference to your No. 47 of 18th July 1883, I am now directed by the Financial Commissioner to forward, in original, for the information of Government, the correspondence marginally noted, and to make the following remarks as to certain matters connected with the canals in the Shahpur district.

2. In regard to the proposed extension of the Ràniwah, the Financial Commissioner agrees with the remarks made by the Deputy Commissioner in the letter which is enclosed with the Commissioner's No. 349 of 2nd September last, and it appears unnecessary to offer any opinion as to the repairs projected on the Corbynwah.

3. The subject of private canals, however, which is discussed in this correspondence, is one of great importance, not only in Sháhpur, but in the Province generally; and until the principles upon which it is to be treated have been settled, it is to impossible to undertake the revision of the Canal Act in a really satisfactory way.

On the Chenab.

1. Mukhdúmwála.
1. (*a*) Daimwála.
2. Thattiwala.
3. Mohkamdínwála.

On the Jhelum.

4. Malik Sahib Khán and Pír Haider Shahwála.
5. Amír Chandwála.
6. Malik Jahán Khánwála
7. Malik Fatteh Khánwála.
8. Sultan Mahmúdwála.
9. Nangyána or Nabba.
10. Malik Sáhib Khánwála (new cut).
11. Malik Sáhib Khánwála.
12. Mekanwála.
13. Chilwála.
14. Sarfaráz Khánwála.
15. Jhammatánwála.
16. Natthuwála.
17. Mughlanwála,
18. Mahotawála.
19. Malik Sher Muhammadwála.

4. From the information now furnished, and with reference to the list enclosed with the Commissioner's No. 349, already referred to, it appears that there are now 19 private canals in Sháhpur, as specified in the margin, of which one (No. 1) is furnished with a branch which is sometimes reckoned as a separate canal. Of these 19 there are 3 on the Chenab (Nos. 1—3), 15 on the left bank of the Jhelum (Nos. 4—18), and 1 on the right bank of the Jhelum (No. 19).

5. In the case of Nos. 15, 16 and 17, all the land irrigated is owned by the canal proprietors, These, however, are comparatively small works, being joint stock canals dug by certain villages near the river to irrigate their own lands.

In the case of No. 5, all the land irrigated is either owned or leased by the canal proprietor; and in the case of No. 19, all the land irrigated is leased by the owner of the canal.

6. But in all other cases, the canals are used to irrigate lands which belong partially or altogether to persons who have no share in the canal. In cases Nos. 1—3, 7—9, 11 and 13, the canal owners own part of the land irrigated. In the remaining cases, *viz.*, Nos. 4, 6, 10, 12, 14 and 18, the canal owners own none

of the land irrigated; but in cases Nos. 4, 12 and 14, they have rights over a part of it, either by lease or mortgage.

7. On the Chenab canals, cash rates are charged for water. The Financial Commissioner believes that the charge is usually about 10 annas a bigha, or Re. 1-4-0 per acre. On the Jhelum canals the universal rate is one-quarter of the produce.

Authority for construction.

8. As to authority for construction, there is none on record in regard to Nos. 1—3, 10 and 15—17; or 7 canals in all. For the construction of the other 12, authority, in some shape or other, can be adduced. Six are said to have been sanctioned by the Deputy Commissioner only, *viz.*, Nos. 4, 8, 9, 13, 14 and 18; but the Financial Commissioner believes that, in nearly all these cases, if the original records were carefully examined by the local officers, it would be found that an express or implied sanction from higher authority had also been obtained. No. 6 was sanctioned by the Commissioner, and No. 19 by the Financial Commissioner. In the remaining four cases (Nos. 5, 7, 11 and 12) permission to construct or improve the canal was given by Government.

Areas to be irrigated.

9. As to the areas which were intended to be irrigated from these canals, there appears to be a distinct restriction to a particular area in case No. 5, and a similar restriction might perhaps be fairly implied in cases 8, 9, 13 and 14. But, with the exception of case No. 9, which may be considered a joint stock canal, the rest of these works were constructed to irrigate, in the first place, lands leased to the canal owners; and the Financial Commissioner believes that it was a well understood thing at the time of construction that, in lieu of the permission then given to take the canals through private lands, water should be given, when available, to the owners of these private lands. In the remaining cases in which authority exists for the construction of canals, the area intended to be irrigated is doubtful. So also in the cases of canals for the construction of which no authority is extant.

Conditions on which land was taken up.

10. As to the way in which land was taken up for these canals, there is, so far as can be judged from the present papers, some doubt and great discrepancy in different cases. As a matter of fact, apart from the cases of joint stock canals dug through the owner's own lands and intended for the owner's own uses, the Financial Commissioner believes that no compensation was ever paid for the land occupied by these canals, but that the proprietors of these lands surrendered them for the use of the canal, on a promise to receive water from the canal when available. But so far as can be gathered from the present papers, it appears that, in one case (No. 16), the canal makers own the land occupied by the canal; in another case (No. 14), the canal bed is said to have been acquired on payment. In four cases (Nos. 2, 6, 9 and 12) special terms as to water-supply are said to have been made with the bed owners. In case No. 7, the bed is said to have been acquired partly on payment, and partly without either payment or terms, and in case No. 1 the bed seems to have been taken partly on special terms of water-supply and partly without terms or payment.

11. It is clear from these facts and presumptions, that the state of rights in these canal beds requires to be carefully investigated and brought to record. The investigation can be best made by the Settlement Officer at the approaching settlement. The Financial Commissioner believes that, except in the cases of canals dug through the canal maker's own land, it will be found that the canal bed is held merely for the use of the canal and not in full proprietary right, that is to say, that if the canal ceased to work, or were abandoned, the bed land would not be retained by the canal proprietor, but would revert to the original owner. The beds of the Government canals in the Mooltan, and much of the bed of the Western Jumna Canal is held on a similar tenure. The Financial Commissioner does not believe that it will be found that these canal beds have been occupied without consent, express or implied; nor even if this were otherwise, is it likely that either the land itself or compensation in money for the use thereof either could be or would be now claimed. All that would be asked for, is the right to obtain water from the canal, either at the customary rate or at any lower rate that Government may fix as a maximum.

Mode in which canals are cleared.

12. Lastly as to clearance, the Financial Commissioner observes, from the Commissioner's letter No. 420 of 21st October last, that the private canals are cleared by paid labour, and not by any *begár* or *cher* labour arrangement of the irrigators.

13. Having thus summarized the main facts of the case, the Financial Commissioner proceeds to state the conclusions at which he has arrived. In the first place, it is clear, as has already been suggested above, that at the approaching re-settlement of the district, the Settlement Officer should record with care the state of rights in the canal beds. If he exercise discretion in not stirring up unnecessary disputes, this will not be a matter of special difficulty, any more than it was in Mooltan, in Muzaffargarh and in the Delhi Division. In the second place, the Financial Commissioner considers that it is not possible to raise objections to the sale of water on existing private canals. The sale undoubtedly allows cultivation to be practised in places where it would not otherwise be possible. It is by so much a real benefit to the country, and if it were stopped, the order would probably affect very seriously the agriculturists who have extended their cultivation on the assurance that the canal owners would supply them with water. Moreover, the giving of such supplies of water was distinctly contemplated in some of the projects sanctioned by Government, and in respect to these, we could hardly stop it if we would. In the other cases we have recognised the sale and allowed it to go on for a number of years; and it seems consistent, neither with propriety nor honesty, to put a stop to it now, unless by purchase of the water-seller's vested interest. At the same time it will be perfectly fair to see that no existing canal is enlarged so as to allow an increase in water sales except with permission and under proper conditions. In this connection, it may be well to point out that all projects for new private canals (including extensions of old ones) will require very careful arrangement. A new private canal, which does not interfere with a Government project, or irrigate land not belonging to the canal maker, may seem an unobjectionable improvement. But if afterwards either the land or the canal were sold, or both were sold to different persons, the same state of things would be reproduced which is now giving trouble in Shahpur.

14. In the next place, it seems clear that Government cannot now assert any right to stop the water-supply in these canals. A canal made by permission must, the Financial Commissioner considers, be held to have received permission to use water for the canal; and though no particular time may have been fixed during which this permission would remain in force, yet it seems clear that it cannot be arbitrarily withdrawn, and the equitable view undoubtedly is that the permission ought to remain as along as the canal remains. Similarly, in canals made without express authority, Part IV of the Limitation Act has now probably given an indefeasible title to water. It, therefore, is not improbable that any attempt to stop water-supply, if such should be made, would lead to an appeal to the Civil Courts; both undesirable in itself and in all likelihood of very unfavourable result. These remarks do not, of course, apply to any measures taken to prevent an *increased* supply to existing canals. Such measures might be fair enough, unless proper conditions were arranged.

15. These matters being premised, the Financial Commissioner now comes to the main questions, *viz.*, what we want in regard to these private canals and how we are to obtain it.

The Financial Commissioner considers that our objects are—

1st—To secure to the canal owner a fair profit on his venture.

2nd—To secure for Government a fair revenue on account of the increase in agricultural resources and certainty of crop prospect which result from the construction of the canals.

3rd—To prevent undue exactions by the canal owners from private irrigators.

4th—To prevent arbitrary withdrawal by them of water from irrigators.

5th—To prevent the ruin of the canals owing to mismanagement or neglect by the owners.

No questions will probably be raised as to the first two of these objects, and the second three are equally important in a case in which the canal owner is in possession of a monopoly, upon which considerable populations are dependent, not only for prosperity, but often for absolute livelihood.

16. The plan to attain these objects, which is preferred by the Financial Commissioner, is to take power by legislation to fix maximum rates for water supplied by private canals, and to take over the management of the canal, in case the owner refuses to supply water at these rates. The maximum rates would, of course, be so fixed, as to give the canal owner a fair profit, say 10 per cent. on his venture, but not more. As a matter of fact, the present water rate on the Jhelum—¼ produce—is a rate which could only be paid on waste land which has not hitherto been assessed to Government revenue. If enquiry were made, the Financial Commissioner thinks it would be found that nearly all the land which is now paying this rate, is land which was waste and unassessed to land revenue when it first received irrigation. When it comes to be assessed in the new settlement, it will be quite unable to continue to pay so high a water-rate, unless the Government revenue is sacrificed. The Financial Commissioner, therefore, concludes that it is necessary to take power to fix a maximum rate to be charged by the canal owner. Having done this, we could assess lands irrigated by private canals in their irrigated aspect, as proposed by Mr. Lyall in this office letter No. 1258 of 2nd December 1882, which is printed in the Punjab Government Revenue and Agricultural Proceedings No. 2 of July 1883. In fixing the assessment, the Settlement Officer would, of course, take into consideration the payment made by the owner of the land to the canal owner; and, as before stated, these payments would be so fixed by maximum rates, as to give the canal owner a fair return for his outlay in providing the supply of water used.

17. It would also be necessary to give the Deputy Commissioner powers to prevent arbitrary withdrawal of water, and power to interfere or take over the management of any canal which failed to irrigate properly from mismanagement or neglect.

18. The system thus recommended, is akin to that in force on the Sirhind Canal. If adopted, there would apparently be little harm in a considerable extension of private canals, in places where Government is not likely to undertake irrigation projects. To carry out this system, it would further be necessary to take powers for the compulsory acquisition of land, and for furnishing bridges and other crossings in connection with these undertakings.

19. The decision arrived at in this case will not only affect Shahpur, but may have considerable influence on the new assessment of Ferozepore, and generally on other private irrigation projects elsewhere. As soon as the Financial Commissioner is put in possession of the Government views, he will be in a better position to undertake seriously the revision of the existing Canal Act.

20. A separate note on the subject by Lieutenant-Colonel Wace, the 2nd Financial Commissioner, is also enclosed.

No. 349, dated 2nd September 1884.

From—H. E. Perkins, Esquire, Commissioner and Superintendent, Ráwalpindi Division.
To—The Secretary to Financial Commissioner, Punjab.

No. 334, dated 23rd July 1884.
No. 402, dated 21st August 1884.

In reply to your No. 7669, dated 30th August 1883, I have the honour to forward, in original, the two letters from the Deputy Commissioner, Shahpur, noted in the margin, with the map required, and to intimate that a much more full report, with a detailed letter from myself, is nearly ready in reply to your No. 721, dated 28th January last, and you will probably find it convenient to dispose of both together, as they are practically the same thing.

No. 334, dated 23rd July 1884.

From J. W. Gardiner, Esquire, Deputy Commissioner, Shahpur,
To—The Commissioner and Superintendent, Ráwalpindi Division.

I regret that your No. 3394, dated 7th September last, has remained so long unanswered: the delay has been due to the difficulty which I have experienced in the preparation of the large map which was called for by the Financial Commissioner.

2. I have now the honour to submit copy of a memorandum which was recorded by my predecessor before he left the district in February last. This contains replies to paragraphs 2, 3, 4 and 5 of Senior Secretary to Financial Commissioner's No. 7669, dated 30th August 1883. As I have not held charge of this district during a cold weather, I am hardly in a position to give an opinion of any value on the points mooted.

3. But as regards the extension of the Rániwah, I would note that it does not seem clear what rights would exist in the extension, if it is constructed by the free labour of persons who settled on the land which the canal would irrigate. The Ferozepore and Sirsa inundation canals I believe are regarded as the property of the persons who constructed them, while the existing Rániwah is understood to be a Government canal. It would, however, be very inconvenient for the extension to belong to private persons, and the canal itself to Government, and it is, therefore, probably intended that the extension should be constructed by the land-owners, but become the property of Government, and be maintained by Government when the work has been completed. But this plan has not, I believe, been adopted by Colonel Grey.

4. Colonel Corbyn states, in his memorandum, that the present Rániwah was constructed by takávi advance; and yet the Rániwah is a Government Canal. But then the landowners who took the advances had, as I am told, very little to do with the money itself. The advances were taken in their names, and they gave security for their repayment; but the money was spent under the Deputy Commissioner's direction and repaid out of the water-rates levied.

5. The owners of private canals have made such large profits under the present arrangements, that it is the desire of every land-owner to have, either in whole or in part, a private canal of his own; and if land-owners discover that Government cannot, or will not, construct the extension of the Rániwah from its own funds, they may perhaps hold out in the hope of securing some rights in the canal for themselves. I would, therefore, strongly recommend that the Rániwah be extended by Government itself from its own funds.

6. As regards the Corbynwah, of the improvements suggested by Mr. Catton, all have been executed except two, *viz.*, the floor of a bridge and one water-course head: and no great expenditure will be required for these. But money from the District Fund balances of former years will be required for ordinary repairs during the current financial year, for the annual repairs of two seasons have to be provided during the current financial year. On 1st April last, the annual clearances on account of last year had still to be made, and in consequence of the short time remaining before the rise of the river was to be expected, and of the small amount of money available, I was only able to put the canal into working order for a part of its course, and water has not reached Khushab this season. But a certain sum of money was spent, and if the annual clearances and repairs are to be effected before March 31st, the provision in the District Fund Budget will have to be supplemented by a sum of about Rs. 1,200 from the balances of former years.

7. For the satisfactory management of private canals, it seems essentially necessary that some powers of control should be given to the Deputy Commissioner or Canal Officer. Thus, for instance, there is no legal way of compelling a land-owner to allow a private canal to pass through his land; and so one obstinate and quarrelsome person can prevent the extension of irrigation to a large tract of country, and the result is that, canal-owners take their canals through private lands in an illegal way. There is also no legal way of compelling the owner of a private canal to provide bridges for public or semi-public roads across which his canal passes. In these, and perhaps some other respects, the authorities should have the same powers as in the case of Government canals.

8. The map* called for by the Financial Commissioner is herewith submitted, and on it have been noted, in red ink, the numbers of private canals as entered in the list appended to this letter. In this office No. 550, dated 22nd December last, it was reported that there were 20 private canals in the district, while 19 only are now entered in the list and map; the diffierence is due to the omission in the present list of the Daimwála cut which is really a branch of the Makhdúmánála can...

*Not printed.

Memorandum recorded by Lieutenant-Colonel E. C. Corbyn, Deputy Commissioner, before leaving the Shahpur District.

If the Ráníwah canal is not taken over as an Imperial canal, or its extension met by the Provincial Government, I have arrangments cut and dry, for its extension by takkávi advances, on the same terms as it was originally cut. If, however, the Lieutenant-Governor does not approve of such an arrangement, I think the scheme proposed, of having it extended by settlers, could be easily carried out.

2. As we have a large sum of money belonging to Umar Hayát Khán's estate to invest, and it is proposed to invest it in land, the Deputy Commissioner would be glad, with the concurrence of Government, to invest it in the manner proposed by His Honor the Lieutenant-Governor as regards settlers, which could be readily and easily done.

3. As regards improvements to Corbynwáh, Colonel Home, on his recent visit, promised to lend an Assistant Engineer to suggest improvements in view to its further extension into the Khusháb Rakh.

4. As to private canals, I feel sure that, had I had time, I could have persuaded the owners of private canals to accept Sir Charles Aitchison's very liberal offer. I must now leave this to my successor.

5. The particulars called for in regard to private canals in the Shahpur District have already been embodied in a report submitted in this office No. 550 C., dated 22nd December last.

List of Private canals now existing in the Shahpur District.

On the Chenab.

1. Makhdúmwála Canal.
2. Thattiwála Canal (also known as Rahmatwála).
3. Mohkamdínwála Canal,

On the Jhelum.

4. Malik Sáhib Khán and Pír Haidar Shahwála Canal (also known as Píranwála).
5. Amír Chandwála Canal.
6. Malik Jahán Khánwála Canal.
7. Malik Fateh Khán and Hakim Khán Núnwála Canal.
8. Sultan Mahmúdwála Canal.
9. Nagyána or Nabba Canal.
10. Malik Sáhib Khánwála Canal (new cut).
11. Malik Sáhib Khánwála Canal.
12. Mekanánwála Canal (also known as Wadhraar Bhái Khánwála).
13. Chilwála or Jahán Khánwála Canal.
14. Sarfaráz Khánwála canal.
15. Jhamatanwála Canal.
16. Nathuwála Canal.
17. Kandanwála or Múghlánwála Canal.
18. Mahofanwála Canal.
19. Malik Sher Muhammad Khánwála Canal.

No. 402, dated 21st August 1884.

From—J. W. Gardiner, Esquire, Deputy Commissioner, Shahpur,
To—The Commissioner and Superintendent, Ráwalpindi Division.

With reference to his No. 2899, of 1st instant, has the honour to submit a statement of the private Inundation Canals in this district, containing information on the points noted in paragraph 10 of Punjab Government letter No. 47—926, dated 18th July 1883, to address of Secretary to Financial Commissioner, Punjab.

STATEMENT GIVING PARTICULARS OF PRIVATE CANALS IN THE SHAHPUR DISTRICT.

Statement giving particulars of Private Canals in the Shahpur District.

Name of Canal.	Name of constructor.	Date of construction.	Present owners.	Terms, if any, on which permission to construct the canal was given.	Water-rates charged by the owner of the canal.
Makhdúmanwála ...	Sultan Muhammad, Mukhdúm, and Diám, Lambardar of Badar.	1866 ...	Fateh Muhammád, Makhdúm, and Rahmat Khán of Badar.	No permission for the construction of this canal is on record.	Re. 1 to Re. 1-4 per acre.
Thattiwála ...	Rahmat Khán of Badar ...	1881 ...	Rahmat Khán of Badar ...	Ditto ditto ...	Re. 1 per acre.
Mohkamdínwála ...	Mohkamdín, Lambardár, and his brother Ala Bakhsh, of Midh.	1865 ...	Mohkamdín ...	Ditto ditto ...	Ditto.
Malik Sáhib Khán and Pír Hyder Skahwála.	*Malik* Sáhib Khán, Tiwána, and *Pír* Hyder Sháh.	1871 ...	*Malik Umr Hayát Khán* and *Pír* Said Mír.	Permission was granted by the Deputy Commissioner, Shahpur, for the construction of this canal on 9th March 1871. The terms agreed to by the constructor were that he will keep in repair the public road on one side of the canal to the breadth of 20 feet from its bank.	One-fourth of the produce of lands irrigated from the canal goes to the canal-owners.
Amír Chandwála ...	*Lala* Amír Chand and Pandit Rúp Lal.	1865 ...	Amír Chand ...	Permission to construct the canal was obtained from the Deputy Commissioner, Shahpur, whose order was confirmed by Punjab Government in their No. 369, dated 6th May 1865, *vide correspondence published in Supplement* to the *Punjab Gazette* of 1865, page 165.	Water not supplied to persons having no share in the canal.
Malik Jahán Khanwála ...	Malik Jahán Khán, Tiwána ...	1868 ...	Malik Hayát Múhammad Khán Nún.	Permission to construct the canal, obtained from Deputy Commissioner, Shahpur, whose order was confirmed by the Commissioner, Ráwalpindi Division. The construction of the canal was sanctioned in order to enable the constructor to irrigate land leased to him in Rakh Khan Muhammadwála	One-fourth of the produce of land irrigated from the canal goes to the canal owner.
Malik Fateh Khán and Hakim *Khan*, Núnwala.	Maliks Fateh Khán, Nun, and Hakím Khan.	1866-67...	Malíks Hayát Muhammad Khán and Hakim Khán.	Permission was obtained from the Deputy Commissioner, Shahpur, to construct the canal for the purpose of irrigating land of Rakh Cháwa leased to constructors, as also lands belonging to other villages. This permission was confirmed by the Punjab Government, *vide* Secretary's No. 175, dated 20th March 1867, to the address of the Financ al Commissioner.	Ditto.
Sultan Mahmúdwála ...	Sultan MahmúdKhan ...	1863 ...	Malik Khuda Bakhsh ...	Permission was obtained from the Deputy Commissioner to construct the canal for the purpose of irrigating land in Chak Lak leased to the constructor, *vide* Deputy Commissioner, Shahpur's No. 660, dated 5th December 1862.	Ditto.
Nagyána or Nabba ...	Hashmat, Muhammad Panah, &c.	1870 ...	Hashmat, Muhammad Panah, &c., of Nabba.	Permission to construct the canal was obtained from the Deputy Commissioner of Shahpur.	Ditto.
Malik Sáhib Khánwála (new cut).	Malik Sáhib Khán, Tiwána ...	1870 ...	Malik Umr Hayát Khán ...	No permission for the construction of this canal is on record.	One-fourth of the produce of lands irrigated from the canal goes to the canal-owners.
Malik Sáhib Khánwála ...	Ditto ...	1861 ...	Ditto ...	Permission to construct the canal for irrigating land in Chak Kalra, leased to Sahib Khan, was granted by Punjab Government *vide* Commissioner, Rawalpindi Division's No. 269, dated 26th December 1860, to the Deputy Commissioner, Shahpur.	Ditto.
Mèkanánwála ...	Khanjar Khán aud Bhai Khán of Kot Bhai Khán.	1870 ...	Malik Khuda Bakhsh, Tiwana, Muhammad Khán and Fazl Ilahi. Kambo, and Nawab Ata Muhammad Khán, Khagwáni.	No permission for the construction of this canal is on record; but when Nawab Ata Muhammad Khan, Khagwani, obtained a share in it, Government granted him permission to widen and extend it through Government Rakh land to Chak Masar, leased to the Nawáb, *vide* Secretary to Government, Punjab's No. 453, dated 16th April 1881, to the Secretary to the Financial Commissioner, Punjab.	Ditto.
Chilwála *or Jahán Khánwála*,	Mr. Chill ...	1864 ...	Malik Jahán Khán, Tiwána ...	Permission to construct this canal was granted by the Deputy Commissioner, Shahpur, to enable the constructor to irrigate land in Rakh Pindi Jari sold to him by Government, *vidé* Deputy Commissioner, Shahpur's, No. 286, dated 4th May 1864, to the Commissioner, Rawalpindi Division.	One-fourth of produce of the lands irrigated from the canal goes to the canal-owner, who also levies Rs. 22 for each jhalár constructed on his canal.
Sarfaráz Khánwála ...	Sarfaráz Khán, Ráis. of Isa Khel	1866 ...	Muhammad Nawáz Khán and Abdul Rahman Khán.	Permission to construct the canal was obtained by the Deputy Commissioner, to enable Sarfaraz Khan to irrigate lands leased to him in Rakh Chhaoni.	One-fourth of produce of the lands irrigated goes to the canal-owner.
Jhammatanwála ...	Charágh and Rihan, Lambárdars of Jhammat.	1865 ...	Charágh, Dilawar and Murad ...	No permission for the construction of this canal is on record.	Water not supplied to persons having no share in the canal.

Name of canal.	Name of constructor.	Date of construction.	Present owners.	Terms, if any, on which permission to construct the canal was given.	Water-rates charged by the owner of the canal.
Nathúwála ...	Proprietors of the villages of Midh Mangowal Thatti, Naka, Ichhar and Nathúwala.	1869 ...	The proprietors of the villages mentioned in column 2.	No permission for the construction of this canal is on record.	Water not supplied to persons having no share in the canal.
Kandanwála or Mughlánwála	Proprietors of the villages of Kandan, Mughlánwála, Khichi, Tankiwála, Sábowál, Thatti, Mualam Wahdi, Thatta Nún, Gujránwála, and Mangowál Khurd.	1869 ...	Proprietors of the villages mentioned in column 2.	Ditto. ditto. ...	Ditto.
Mahotáwála ...	Sultán Mahota ...	1862 ...	Jahána of Wasu ...	The Deputy Commissioner, Shahpur, granted permission to construct the canal for general irrigation, and not for irrigation of any particular land.	Various.
Malik Sher Muhammad Khanwála.	Malik Sher Muhammad Khán, Tiwána.	*1863* ...	*Malik* Sher Muhammad Khán, Tiwána.	The Financial Commissioner's permission was obtained to construct the canal for the purpose of irrigating a portion of Rakh Rajar, leased to the constructor, *vide* Secretary, Financial Commissioner's Nos. 1675 and 2837, dated 11th March and 22nd April 1872, respectively, to the address of the Commissioner, Ráwalpindi Division.	Water seldom supplied to persons having no share in the canals. *Note by Commissioner.* This was only because Mr. Frizelle prevented it, and his action has been Sher Muhammad's great grievance ever since. There is no doubt that his prime object in making the canal was to sell the water. H. Perkins, *Commissioner.* This remark of the Commissioner's is quite incorrect. His primary object was to extend the canal to irrigate the lands of Rakh Khusháb, He was allowed by the then Commissioner, Mr. Macnabb, to give water to the villages of Ghag and Sandhrál, because he had more than sufficient to irrigate the small area of Rakh Rajar. The Malik was not quite fairly treated by Colonel Corbyn. W. G. Davies, *Financial Commissioner.*

Shahpur :
The 21st August 1882.

J. W. GARDINER,
Deputy Commissioner.

No. 420, dated Ráwalpindi, 21st October 1884.

From—H. E. PERKINS, Esquire, Commissioner and Superintendent, Ráwalpindi Division,
To—The Offg. Senior Secretary to Financial Commissioner, Punjab.

No. 340, dated 25th July 1884.
No. 448, dated 22nd September 1884.
No. 485, dated 11th October 1884.

I HAVE the honour, in reply to your No. 721, dated 28th January last, to forward copies of the letters as per margin, from the Deputy Commissioner, Shahpur, to my address, touching the question of private canals in that district. These letters and enclosure appear to exhaust the subject so far as the Financial Commissioner's queries are concerned; but as the results of my own knowledge are asked for, and comments are invited, I offer the following remarks.

2. On the subject of the Financial Commissioner's query (*iii*), I would note that the deduction of 188 acres from the originally sanctioned grant of 1,400 acres, has been made a great grievance by Malik Jahan Khán, and the Deputy Commissioner reports that the land, on being measured, was found to be 1,288 acres only. The whole case was fully dealt with on the spot by Mr. D. C. Macnabb and Colonel Corbyn, and last year there appeared to me, when I investigated it in the district, to be no room for reconsideration, and I am still of the same opinion.

3. On the Financial Commissioner's query (*vii*), I would refer you to the still pending correspondence touching the projected sale of his rights and interests by Lala Amír Chand to Abdulla Khan, Extra Assistant Commissioner, the last letter on which is your office No. 5204, dated 7th July last, to which the Deputy Commissioner has not yet replied.

4. The acquisition of land for these canals has been done in a haphazard way. In most cases no doubt the owners of land taken up for a private canal have received as much water gratis therefrom, as would compensate them. In some instances the stipulations under which this arrangement was maintained, have been totally denied, or unworthily retracted by the canal-owners, and notably in the case of Malik Sahib Khán's where I have had to insist on the Court of Wards fulfilling the engagements which it had inherited from that gentleman. There was also oppression practised by Nawáb Ata Muhammad Khán through the influence of his brother, Ghulám Muhammad Khán, Extra Assistant Commissioner, and some land was forcibly taken for nothing. This has now ceased, and people are at present so much alive to their rights, that Maulvi Zulfikár Ali, late Judicial Asssistant, has been obliged to surrender his lease of 4,000 acres through the impossibility of inducing owners to part with land required for the canal.

5. Another point on which I must remark is the loss sustained by Government canals, owing to the *begâr* system and non-payment of full wages to labourers, whether voluntary or pressed men. It has worked in this way—that the best labourers being Patháns who will brook no force or suppression of their wages, the owners of all these private canals could command the labour of these immigrants as soon as ever the clearance season began, because they paid full rates, and that punctually. All through November and December private canals were in the workmen's hands, and their repairs were finished before the Deputy Commissioner could begin his. I walked along some miles of the Rániwah on 20th February 1883, and found the annual repairs in that part not begun; though I was told that it had commenced in another part of the same canal. From this it has resulted that the early part of the irrigating season has been lost to Government canals, while private canals were in full flow,—and this while private canal-owners are paying nothing to the State, and Government is the owner of all the running water. Comment on such an inversion of rights is needless.

6. This leads me to discuss what should now be done towards asserting the rights of Government. I have considered the passages from former orders which are extracted in the closing part of your letter under reply. It appears from Mr. Gardiner's report, that heretofore no publicity has been given to those orders, and the object of every canal-owner has been to grasp as much Government water as he could, and to make his own profit out of it. A notable instance of this was reported to you by Colonel Cracroft's letter No. 397, dated

12th October 1876, regarding the canal made by Malik Sher Muhammad Khan, ostensibly for watering his grant at Chak Rajar, but really to conduct three times as much water as he needed, and sell it as widely as he could. I think the time has now come when Government should assert its rights as lord of the water, and should charge rent. The simplest plan, in my judgment, would be to levy so many rupees a year from the owner of each canal for each square foot in area of the head. Take Rs. 2 a square foot for example. Then, if the opening out of the river were 20 feet and wide, and running 5 feet deep in a moderate flood, this would give 100 square feet, and he would pay Rs. 200 a year to Government. Probably this would be the largest sum any man would have to pay. A canal of only 10×3 would pay Rs. 60 if it irrigated other peoples' lands; but probably so small a canal would not carry any more water than its maker required for himself, and so would remain untaxed, as I do not suppose Government would wish to levy a water rent on the owner's own lands.

7. Of course there is the alternative method of levying from the canal-owners so much per acre of land other than his own which he fertilizes. I prefer the first plan, on account of its simplicity, its avoidance of annual inquisitions, and of the consequent bribery to patwárís and other officials. It would certainly not be equally precise with an acreage rate, and might not be equally lucrative to the State; but I apprehend that our primary purpose is not so much to enhance the revenue, as to assert forcibly a right heretofore neglected. See for example Colonel Corbyn's report herewith on the little Mokandinwála and Daimwála canals on the Chenab, which were made without any permission whatever.

8. I think that if my proposal be adopted, the area of each canal head should be fixed by the Deputy Commissioner or Settlement Officer himself on some occasion while it was running, and that such measurement be never altered except on cause shown and a fresh inspection by the Deputy Commissioner at the instance of one or other party to the contract.

No. 340, dated 25th July 1884.

From—J. W. GRADINER, Esquire, Deputy Commissioner, Shahpur,
To—The Commissioner and Superintendent, Ráwalpindi Division.

WITH reference to the Senior Secretary to Financial Commissioner's letter No. 721, dated 28th January last, copy of which was received under cover of your docket No. 417, dated 2nd February 1884, I have the honor to report as follows :—

I.—The Kalra lands are now held in proprietorship by the heirs of the late Malik Sáhib Khan, C.S.I. The proprietary right was granted by letter No. 550, dated 31st July 1876, from the Under-Secretary to Government of India, Department of Agriculture, Revenue and Commerce, to the Secretary to Government, Punjab, copy of which was forwarded to the Commissioner, Ráwalpindi Division, with Financial Commissioner's No. 4988, dated 18th August 1876. No reservation was made at the time of the right of Government in the water or of any other rights connected with the canal.

II.—The lease of 1,360 acres of land in Rakh Kot Pahlwan and of 2,812 acres of land in Chak Chhaoni was granted to Náwab Sarfraz Khan by the Secretary to the Financial Commissioner's No. 62, dated 5th February 1869, and No. 2426, dated 15th May 1868, respectively, and on expiration of the terms, both the leases were renewed in favour of the Nawáb till next revision of settlement (*vide* Secretary to the Financial Commissioner's No. 5978, dated 1st September 1879, and No. 4149, dated 28th June 1878). A copy of the lease of Rakh Kot Pahlwan is enclosed. Nawáb Sarfraz Khan has since died, and the lease is held by his sons.

III.—In this office No. 206, dated 4th May 1864, reference is made to Mr. Chill's purchasing 3,000—not 300—acres of land in Rakh Pindi Jauri, and his making a cut from the river to irrigate it. On the death of Mr. Chill in 1870, the land and the canal were purchased by Malik Jehan Khan for Rs. 36,100. The Malik subsequently improved this canal, which now irrigates almost all his land in Rakh Pindi Jauri, as well as the 1,212 acres of land leased to him in Rakh Sháhpur under authority of the Secretary to the Financial Commissioner

Punjab's docket No. 1308, dated 5th March 1878, to your address. This docket sanctioned a lease of 1,400 acres in Rakh Shahpur, but 1,212 acres only were actually leased to Jehan Khan.

IV.—The case of the lease of 2,500 acres in Rakh Chawa to Fateh Khan Nún was reported for orders in this office No. 283, dated 14th July 1883, to your address, to which no reply has as yet been received. All the particulars now asked for will be found in that letter, and the deed of lease of which the Financial Commissioner desires a copy, will be found in the vernacular *misl* which was submitted with it. Government did not reserve any rights in Malik Fateh Khan's canal.

V.—The present owners of the Mekanawala Canal are Fazl Elahi, Malik -huda Baksh, Tiwána, Muhammad Khan, and Nawáb Ata Muhammad Khan. They hold Government rakhs on leases for cultivation, *viz.*, Fazl Elahi, Khuda Bakhsh and Muhammad Khan, 1,342 acres in Rakh Wadhra, the lease of which was sanctioned in the Secretary to the Financial Commissioner's No. 3996, dated 17th June 1874; and the Nawáb 3,135 acres in Rakh Masar, the lease of which was sanctioned in the Secretary to the Government Punjab's No. 812, dated 14th May 1878, copy received under cover of your No. 4049, dated 14th October 1878. The 2,750 acres of land irrigated from the Mekanawala Canal form part of the area of these rakhs.

VI.—Government in no way reserved any rights relating to the canal made by Malik Sultán Mahmúd Khan to irrigate land in Chak Lak, of which the proprietary right was given him by orders contained in the Secretary to the Financial Commissioner's No. 2160, dated 23rd March 1880.

VII.—Leases of 2,130 acres in Rakh Miáni and 1,065 acres in Rakh Bír Baran were granted to Amír Chand and Pandit Rúp Lal for clearing out the old Ráníwah channel. On expiry of the term of the leases, they were renewed under orders contained in the Secretary to the Financial Commissioner's No. 129, dated 5th January 1875, till next revision of settlement as follows:—

In favour of Amír Chand, a lease of 2,130 acres in Rakh Miáni.

In favour of Amír Chand and Ram Jowaya (son of Pandit Rúp Lal) a lease of 1,065 acres in Rakh Bír Baran.

VIII.—A translation of the rubkar, dated 23rd October 1860, issued by Mr. D. C. Macnabb, late Deputy Commissioner, Shahpur, in the case of Mahotawala Canal is enclosed.

IX.—The canal made by Malik Jehan Khan to water the land leased to him in Rakh Khan Muhammadwála having proved a failure, the Malik applied for cancellation of his lease, and this application was sanctioned by the Secretary to the Financial Commissioner's No. 4074 S., dated 10th July 1875, to your address. No rights have been reserved by Government in the canal.

2. The correspondence of 1865, referred to in paragraph 2 of the Secretary to the Financial Commissioner's letter now under reply, appears to have been sent to this office by the Commissioner merely "for information," and no action was taken on it (as far as can be ascertained from the records of this office) by the then Deputy Commissioner, Captain Davies. As regards the correspondence of 1867, the question was dealt with in Captain Johnstone's No. 173, dated 27th February 1868, and No. 213, dated 18th March* 1868, paragraph 3. It would thus appear that no publicity was given to these orders on the subject of water rent in this district, nor was the liability to this rent expressly noted in the case of licences given to excavate canals after the date of the orders being issued, nor were those who had already constructed canals called upon to enter into any engagements on the subject.

* Forwarded to the Financial Commissioner by the Commissioner's No. 63, dated 27th March 1868.—H.P.

3. The enclosures of your letter under reply are herewith re-submitted.

LEASE OF WASTE LAND IN THE PUNJAB.

Part I.

This instrument of lease, made on the 27th day of October 1879, between the Government of the Punjab, through its Agent, the Deputy Commissioner, Shahpur, and Nawáb Sarfaraz Khan, the son of Muhammad Khan, hereafter called the lessee, *witnesseth* that, in consideration of the rent herein reserved, and the stipulations herein contained, and to be observed by Nawáb Sarfaraz Khan, his heirs and assigns, the Government of the Punjab doth hereby grant unto Nawáb Sarfaraz Khan and his heirs a lease of all the Government waste lands described in Schedule A, from 1st April 1879 till next revision of settlement, at a yearly rent of Rs. 417.

Grant of lease. Term of lease. Rent reserved.

2. The Government does not grant to the lessee, but hereby excepts and reserves to itself out of and in respect of the said lands all existing rights to and over all mines and minerals, all trees and fuel-timber, all rivers, streams and water-courses, and all thoroughfares within and traversing the said lands.

Exceptions and reservations.

Part II.—Stipulations of the Lessee.

The lessee doth hereby agree—

1. That he will pay the yearly rent reserved in four equal quarterly instalments at Shahpur, on the 15th June, 15th July, 1st December and the 1st day of January: the first instalment to be paid on the 15th June 1879.

Payment of rent.

2. That he will pay, when due, all taxes, rates and assessments, such as road, school, and dâk cesses, and lambardári and zaildári dues, and all other taxes, rates and assessments whatsoever, imposed by competent authority upon, or in respect of, the said lands.

3. That he will permit the officers of Government to enter on the said lands for all purposes connected with the construction, maintenance, or repair of new, as well as of existing, thoroughfares and water-courses.

Right of entry for construction of works, &c.

Provided that no compensation, either by reduction of rent or otherwise, shall become due to the lessee from Government by reason of any such operations.

4. That he will permit the officers of Government, in like manner, to enter and do all acts and things necessary for the full enjoyment of the rights reserved to Government to and over all mines and minerals and trees and fuel-timber on the said lands.

Right of entry to enjoy mines, &c.

5. That he will not do any act inconsistent with, or injurious to, any of the rights excepted and reserved to the Government in clause 2 of Part I of this lease, and will not, in any way, interfere with the lawful use by the public of any thoroughfare within the said lands.

Protection of rights reserved to Government.

6. That he will duly comply with such direction as the Deputy Commissioner of Shahpur shall issue, requiring him to construct boundary marks on the limits of the said land, and will keep them, when erected, in good repair.

Erection of boundary marks.

7. That he will not cultivate or otherwise manage the said lands, or any part of them, in a manner calculated to injure them permanently or to lessen their value.

Husband-like cultivation.

8. That he will not assign or part with the possession of the said lands or any part thereof, except to cultivators holding of himself, without the written permission of Government first obtained.

Not to assign without leave.

9. That he will, at the end or other sooner determination of the term, peaceably leave and surrender the said lands to the Government.

Part III.—Rights and Powers of Government.

It is hereby agreed between the Government and the lessee—

Recovery of rent. 1st.—That arrears of rent may be recovered by Government from the lessee in the same manner as arrears of land revenue may be recovered.

Right of re-entry for non-payment of rent or breach of stipulations. 2nd.—That if any instalment of rent shall be in arrears for 15 days, or if any of the stipulations of the lessee shall not be duly observed by him, the Government may forthwith resume and take possession of the said lands as though this lease had never been granted, and the lessee shall have no right, by reason of such resumption, to recover compensation from Government for any improvement made by him, but the said lands in their improved condition shall vest absolutely in the Government upon possession being taken.

Part IV.—Duties and Liabilities of Lessee.

It is hereby declared and agreed, that the lessee is and shall be bound to

Police duties of lessee. render all such assistance in the prevention and discovery of crime as is incumbent upon land-holders by any law or rules for the time being in force, in the Punjab, and is and shall be responsible in the same manner as village communities are under any track law and rules for the time being in force in the Punjab.

Liability of lessee for neglect of such duties. 2. That if the lessee omit or neglect to perform any obligation imposed upon him by such law or rules, the Government may thereupon cancel this lease and resume the lands, as explained in clause 2 of Part III, in addition to any penalties to which the lessee may be liable under any such law or rules.

PART V.—Rights and Powers of Lessee.

It is also hereby agreed between Government and the lessee—

General rights of lessee. 1. That the lessee is and shall be at full liberty to sink wells, make water-courses, plant trees, build houses and otherwise improve the said lands, and to locate cultivators, and is and shall be solely entitled to all agricultural and spontaneous products not expressly excepted and reserved by this lease.

Right of pre-emption of proprietary right. 2. That if, during the term of this lease, or at its expiration the Government shall resolve to sell the proprietary right in the said lands, the first offer thereof shall be made to the lessee at a reasonable price to be fixed by the Deputy Commissioner of Shahpur, and to be accepted or refused by the lessee within the time named by Government.

Provided that the said proprietary right shall not be transferred to the lessee, unless and until he shall have consented to pay the land revenue assessed upon the said lands by the proper officers of Government;

Provided, further, that the lessee shall have no right to such offer if the said lands be required for any public purpose.

Right to compensation for improvements. 3. That, at the expiration of the term of this lease, and whether the land be or be not required for public purposes, the lessee shall become entitled to compensation as follows:—

Modes of ascertaining amount. All the materials connected with improvements made by the lessee to the said lands may be sold to and purchased by the Government by the mutual consent of Government and the lessee, at a price to be agreed on by them, or to be ascertained in the manner provided in Schedule B. In default of such mutual consent to sell and purchase, the lessee shall forthwith remove all such materials at his own expense.

Except as is hereinbefore agreed, the lessee shall have no claim to compensation from Government for any improvement effected by him, the provisions of any Act in force for the time being as to the acquisition of land for public purposes notwithstanding:

Provided always that no such compensation shall be claimable by the lessee if his lease be renewed.

4. That if, at the expiration of the term of his lease, a settlement of land revenue shall be in progress in the district of Shahpur, and the lessee shall continue in possession with the consent of Government, all the terms of this lease shall, in the absence of an express agreement to the contrary, be deemed to continue in force until the conclusion of the Settlement proceedings.

Interpretation.

In this lease the term "lessee" means and includes the said Nawáb Sarfaraz Khan, the heirs of Nawáb Sarfaraz Khan, and the assigns of Nawáb Sarfaraz Khan or of his heirs.

The term "Government" means and includes every person duly authorized to act for or represent the Government of the Punjab in relation to any matter or thing contained in or arising out of this lease.

As witness our hands this 27th day of October 1879 at Shahpur in the Punjab.

العبد ————	گواہ شد ————	گواہ شد ————
محمد سرفراز خان رئیس عیسے خیل	شیخ دوست محمد مختار	جیونہ قوم داد خیل سکنہ عیسے خیل

(Sd.) J. A. E. MILLER,
Secretary to Financial Commissioner, Punjab.

SCHEDULE A.

Description and boundaries of the lands hereinbefore leased.

One thousand three hundred and sixty acres of land in Rakh Kot Pahalwan, bounded on the north by the lands of the village of Kot Pahlwan, on the south by lands of the village of Kot Bhai Khan, on the east by lands of the village Kot Bhai Khan, and on the west by the lands of the village of Bakhar.

Translation of a Rubkár dated 23rd October 1860, issued by D. C. Macnabb, Esquire, Deputy Commissioner, Shahpur.

Yesterday and to day I myself inspected the canal made by the Sultan Biloch, from the bank of the river to the village of Abúwala. It appeared that during the reign of the kings of Delhi some one excavated a canal in this part of the country, but that by the force of the current the land near the bank situated on the east side was washed away into the River Jhelum, which came close to the village of Bunga Bilochan, *i.e.*, Bunga Khanan, and the head of that canal remained fixed under Mauza Bunga Khanan. The river again changed its course towards the north-west, and is now flowing at a distance of one-and-a-half kos. The Bádsháhi Canal ceased flowing from the day the river changed its course, *i.e.*, it only flowed as before for a few days when the river was in high flood, and dried up as soon as the water in the river subsided; but this happened many years ago, and there are one or two old men still alive who saw the canal running every year.

Two years ago Sultan Biloch excavated a canal head from a branch of the river from a point below the village of Mangrial at his own expense, and brought water into a "chhamb," whence it flowed under Bunga Khanan, and thence on into the land of Kachewala, where it was used. From this space Sultan excavated a canal and bunded up the water, and thus brought it into the Bádsháhi canal at Thatti Dhakwan, and through the Bádsháhi Canal watered the lands of the villages of Thatti Dhakwan, Thatti Saidan, Thatti Hargan and Lammi, and the zemíndárs of Gondal irrigated their lands by means of jhalárs from this canal. The water overflowing the canal at a corner near Thatti Dhakwan, gathered in a large chhamb in the "Kacha," but thence also Sultan re-conveyed the water by means of a dam into the Bádsháhi Canal and extended the canal to the village of Mochiwal beyond Thatti Saidan, where the jhalárs of Mochiwal were made on one side and those of Thatti Hargan and Lammi on the other. From that place the Bádsháhi Canal again turns towards the Kacha; Sultan excavated the canal to a distance of several hundred karús to an old chhamb situate in the lands of Mochiwal, and turned the water in that direction by bunding up the water of the canal. The zemíndárs of Mochiwal began to irrigate their lands from this chhamb by means of jhalárs. The village of Mochiwal was being

wholly ruined owing to drought and the poverty of the proprietors, but has been set up again by means of this canal, and in the course of a single year the zemíndárs have brought into working order four old wells. On enquiring from some of the aged persons present I was told that no one now living recollected ever having seen or heard of water entering this chhamb from the river, except on the occasion of some very high flood; which occurred once perhaps in 20 or 30 years, and that jhalárs were never made on it. Enlarging this chhamb for half a kos, Sultan excavated another canal in the lands of the village of Abúwala, by which water passed through all the lands of mauza Abúwala which is in Chak Lak, as well as those of several other villages, and then reached the boundary of the town of Sahiwal. It is hoped that if Sultan will repair, *i.e.*, renew, the head of the canal by means of a takávi of Rs. 300 from Government this year, the water of his canal will in future easily reach all the lands of Sahiwal. Sultan intends to excavate another branch through the lands of mauzah Mochiwal and to take water through the Bar to the taluqua of Firuka. I am much pleased with the forethought, cleverness and good service towards Government which Sultan has shown by these acts. Therefore I issue this rubkar with a view that in future if a dispute should arise between Sultan and other zamíndárs whose lands adjoin his canal, the officers before whom the case may come up may know that Sultan is in truth entitled to take water-rates on account of this canal, and that if the zamíndárs of Thatti Dhakwan or any other village allege that the canal running in their lands is the old Bádsháhi one, and that no benefit accrues to them from Sultan's acts, their statements might be considered false. Certainly water could reach the old canal in the time of high floods in the river, but then it flowed for ten days only and then dried up; from such water no advantage could accrue to any crop. Jhalárs running for six months will be a great advantage to the crops of chína, jowár, bájra, til, moth and cotton; the land can also be prepared for the rabi crops of gram and wheat, &c. The river has been regularly changing its course in a direction away from this during the last few years, and had not Sultan excavated a canal by expending Rs. 700 from his own pocket and Rs. 300 takávi received from Government, it would have been impossible to work jhalárs in these villages.

As by this work the cultivation of these villages has become easy and in every way advantage accrues to Government, and as in future Government waste lands will be cultivated to a large extent, Sultan must be considered a man of good intentions and a well wisher of Government. It is necessary that District Officers should help him and encourage him, wherefore I order that a copy of this rubkar be given to Sultan and the original filed in the office.

No. 448, dated 22nd September 1884.

From—J. W. Gardiner, Esquire, Deputy Commissioner, Shahpur,
To—The Commissioner and Superintendent, Rawalpindi Division.

Private Canals.

In reply to your letter No. 3283, dated 3rd instant, I beg to state that no reply has been received up to this date to this office No. 283, dated 14th July 1883. Your office No. 2977, dated 7th ultimo, is in answer to my No. 282, dated 21st June last, which refers to a separate case.

2. The vernacular file of the lease of 2,500 acres of land in Rakh Chawa granted to Malik Fateh Khan Nún under orders conveyed in Punjab Government No. 175, dated 20th March 1867, copy of which was received with your office No. 733, dated 1st April 1867, is now in my office; and I therefore beg to enclose a copy of the lease referred to in Financial Commissioner's query No. IV,—*vide* his Secretary's No. 721, dated 28th January 1884. This lease was framed in vernacular, and therefore a translation also accompanies.

3. As regards Financial Commissioner's query No. VII, I beg to enclose a copy of the new leases of land in Rakh Miani and Bir Baran granted to Lala Amír Chand and Pandit Ram Jowaya, respectively. These leases were framed in English.

Translation of Deed of Lease of 2,500 acres of land in Rakh Cháwá granted to Malik Fatteh Khan Nún, by Captain W. G. Davies Deputy Commissioner, Shahpur,—dated 6th April 1867.

This lease is granted to Malik Fateh Khan Nún, Rais of Mitha Tiwána, tahsíl Khushab, district Shahpur, whose application for lease of cultivation of

5,500 acres of land in Rakh Chawa, tahsíl Bhera, by means of irrigation from canal has been sanctioned by Secretary to Government, Punjab's letter No. 175, dated 20th March 1867, a copy of which has been received under cover of Commissioner's docket No. 733, dated 1st April 1867, on the following conditions, which must be fulfilled by the lessee:—

1st.—The lease will run for fifteen years from rabi Sambat 1925 to kharíf Sambat 1939, subject to the following assessments:—

3 years from rabi Sambat	1925	to kharíf Sambat	1927...	Rs. 300	per annum.
5 ditto	1928	ditto	1932...	" 500	"
7 ditto	1933	ditto	1939...	" 700	"

This assessment will have to be paid by the usual instalments for the period of the lease, together with cesses.

2nd.—The lessee will have no title during the period of this lease to proprietary right in the land. On expiry of this period the proprietary right will be granted to the lessee on payment of a suitable nazarána, provided two-thirds of the land leased to him be under cultivation.

3rd.—On expiry of the lease Government will be at liberty to increase or reduce assessment according to the capabilities of the land.

4th.—The lease will be resumable if, after three years, the lessee fails to cultivate the land thoroughly by means of a canal.

The lessee to keep a copy of this lease by him for future reference.

No. 65.

LEASE OF WASTE LAND IN THE PUNJAB.

Part I.

This instrument of lease made on the day of 18 between the Government of the Punjab, through its Agent, the Financial Commissioner for the Punjab, and Amír Chand, the son of late Mohan Lal, Khatri of Bhera, hereafter called the lessee, *witnesseth* that in consideration of the rent herein reserved, and the stipulations herein contained and to be observed by the lessee Amír Chand, his heirs and assigns, the Government of the Punjab doth hereby grant unto Amír Chand and his heirs a lease of all the Government waste lands described in Schedule I, for a term of six years from 1st April 1875, or till next settlement, at a yearly rent of Rs. 770, including Rs. 70 as malikana.

Grant of lease.
Term of lease.
Rent reserved.

2. The Government does not grant to the lessee, but hereby excepts and reserves to itself out of and in respect of the said lands all existing rights to and over all mines and minerals, all trees and fuel-timber, all rivers, streams and water-courses, and all thoroughfares within and traversing the said lands.

Exceptions and reservations.

PART II.—Stipulations of the Lessee.

The lessee doth hereby agree—

1. That he will pay the yearly rent reserved in two equal *half-yearly* instalments at Tahsíl Bhera on the 15th day of June and the 15th day of December, the first instalment to be paid on 1st day of December next.

Payment of rent.

2. That he will pay, when due, all taxes, rates and assessments, such as road, school, and dâk cesses, and Lambardárí and Zaildárí dues, and all other taxes, rates and assessments whatsoever imposed by competent authority upon, or in respect of, the said lands.

3. That he will permit the officers of Government to enter on the said lands for all purposes connected with the construction, maintenance, or repair of new, as well as of existing throughfares and water-courses.

Right of entry for construction of works, &c.

Provided that no compensation, either by reduction of rent or otherwise, shall become due to the lessee from Government by reason of any such operations.

Right of entry to enjoy mines, &c.

4. That he will permit the officers of Government, in like manner, to enter and do all acts and things necessary for the full enjoyment of the rights reserved to Government to and over all mines and minerals and trees and fuel-timber on the said lands.

Protection of rights reserved to Government.

5. That he will not do any act inconsistent with, or injurious to, any of the rights excepted and reserved to the Government in Clause 2 of Part I of this lease, and will not in any way interfere with the lawful use by the public of any throughfare within the said lands.

Erection of boundary marks.

6. That he will duly comply with such directions as the Deputy Commissioner of Shahpur shall issue, requiring him to construct boundary marks on the limits of the said lands, and will keep them, when erected, in good repair.

Husband-like cultivation.

7. That he will not cultivate or otherwise manage the said lands, or any part of them, in a manner calculated to injure them permanently or to lessen their value.

Not to assign without leave.

8. That he will not assign or part with the possession of the said lands or any part thereof, except to cultivators holding of himself, without the written permission of Government first obtained.

9. That he will, at the end or other sooner determination of the term, peaceably leave and surrender the said lands to the Government. The lessee will maintain and keep in proper repair the inundation canal "Ráníwah" and cultivate the land leased to him: if he fail to fulfil these conditions, the lease will be cancelled.

PART III.—Rights and Powers of Government.

It is hereby agreed between the Government and the lessee:—

Recovery of rent.

1st.—That arrears of rent may be recovered by Government from the lessee in the same manner as arrears of land revenue may be recovered.

Right of re-entry for non-payment of rent or breach of stipulations.

2nd.—That if any instalment of rent shall be in arrears for fifteen days, or if any of the stipulations of the lessee shall not be duly observed by him, the Government may forthwith resume and take possession of the said lands as though this lease had never been granted, and the lessee shall have no right by reason of such resumption to recover compensation from Government for any improvement made by him, but the said lands in their improved condition shall vest absolutely in the Government upon possession being taken.

PART IV.—Duties and Liabilities of Lessee.

It is hereby declared and agreed that the lessee is and shall be bound

Police duties of lessee.

to render all such assistance in the prevention and discovery of crime as is incumbent upon land-holders by any law or rules for the time being in force in the Punjab, and is and shall be responsible in the same manner as village communities are under any track law or rules for the time being in force in the Punjab.

Liability of lessee for neglect of such duties.

2. That if the lessee omit or reglect to perform any obligation imposed upon him by such law or rules, the Government may thereupon cancel this lease and resume the lands, as explained in Clause 2 of Part III, in addition to any penalties to which the lessee may be liable under any such law or rules.

PART V.—Rights and Powers of Lessee.

General rights of lessee.

It is also hereby agreed between Government and the lessee:—

1. That the lessee is and shall be at full liberty to sink wells, make water-courses, plant trees, build houses, and otherwise improve the said lands and to locate cultivators, and is and shall be solely entitled to all agricultural and spontaneous products not expressly excepted and reserved by this lease.

Right of pre-emption of proprietary right.

2. That if during the term of this lease or at its expiration the Government shall resolve to sell the proprietary right in the said lands, the first offer thereof shall be made to the lessee at a reasonable price to be fixed by the Deputy Commissioner of Shahpur District and to be accepted or refused by the lessee within the time named by Government.

Provided that the said proprietary right shall not be transferred to the lessee, unless and until he shall have consented to pay the land revenue assessed upon the said lands by the proper officers of Government.

Provided, further, that the lessee shall have no right to such offer if the said lands be required for any public purpose.

Right to compensation for improvements.

3. That at the expiration of the term of this lease, and whether the land be or be not required for public purposes, the lessee shall become entitled to compensation as follows:—

Mode of ascertaining amount.

All the materials connected with improvements made by the lessee to the said lands may be sold to and purchased by the Government by the mutual consent of Government and the lessee, at a price to be agreed on by them, or to be ascertained in manner provided in Schedule II. In default of such mutual consent to sell and purchase, the lessee shall forthwith remove all such materials at his own expense.

Except as is hereinbefore agreed, the lessee shall have no claim to compensation from Government for any improvement effected by him, the provisions of any Act in force for the time being as to the acquisition of land for public purposes notwithstanding.

Provided always that no such compensation shall be claimable by the lessee if his lease be renewed.

4. (That if, at the expiration of the term of this lease, a settlement of land revenue shall be in progress in the district of Shahpur and the lessee shall continue in possession with the consent of Government, all the terms of this lease shall, in the absence of express agreement to the contrary, be deemed to continue in force until the conclusion of the settlement proceedings.)

Note.—This clause is only to be used when the lease is for the te rm settlement.

Interpretation.

In this lease the term "lessee" means and includes the said Amír Chand of Bhera, the heirs of Amír Chand and the assigns of Amír Chand or of his heirs.

The term "Government" means and includes every person duly authorized to act for or represent the Government of the Punjab in relation to any matter or thing contained in or arising out of this lease.

As witness our hands this 29th day of May 1875, at Bhera, Ráwalpindi Division in the Punjab.

گواه شد   گواه شد   العبد

دستخط امیر چند اند دستخط پیرزمان شاه دستخط سودھل کہنہ   (Sd.) C. R. Hawkins,

بقلم خود   *Offg. Secy. to Finl. Commr., Punjab.*

SCHEDULE A.

Description and boundaries of the land hereinbefore leased.

Two thousand one hundred and thirty acres of rakh land of Rakh Miani, the boundaries of which are—on the *north*, the village Pakhowál, on the *south* villages Mona and Khyzur; on the *east*, mouza Pakhowál; and on the *west*, mouza Jewanwál.

No. 65.

GENERAL FORM OF LEASE OF WASTE LANDS IN THE PUNJAB.

PART I.

This instrument of lease made on the 29th day of May 1875, between the Government of the Punjab through its Agent, the Financial Commissioner for the Punjab, and Amír Chand, son of Mohan Lál, and Rámjowia, son of Pindit Hari Chand, deceased, Brahmin, of Bhera, hereafter called the lessees, *witnesseth* that in consideration of the rent herein reserved, and the stipulations herein contained and to be observed by the lessees, their heirs and assigns, the Government of the Punjab doth hereby grant unto Amír Chand and Rámjowia and their heirs a lease of all the Government waste lands described in schedule I, for a term of six (6) years from 1st April 1875 or till next Settlement at a yearly rent of Rupees five hundred and sixty-two, including Rupees seventy-three as malikána.

Grant of lease. Term of lease. Rent reserved.

2. The Government does not grant to the lessee, but hereby excepts and reserves to itself out of and in respect of the said lands, all existing rights to and over all mines and minerals, all trees and fuel-timber, all rivers, streams and water-courses and all thoroughfares within and traversing the said lands.

Exceptions and reservations.

PART II.—Stipulations of the Lessees.

The lessees do hereby agree—

1. That they will pay the yearly rent reserved in two equal *half-yearly* instalments, at Tahsíl Bhera on the 15th June and 1st day of December; the first instalment to be paid on the 15th day of June next.

Payment of rent.

2. That they will pay, when due, all taxes, rates and assessments, such as road, school, and dâk cesses, and Lambardári and Zaildári dues and all other taxes, rates, and assessments whatsoever imposed by competent authority upon or in respect of, the said lands.

3. That they will permit the Officers of Government to enter on the said lands for all purposes connected with the construction, maintenance, or repair of new as well as of existing, thoroughfares and water-courses.

Right of entry for construction of works, &c.

Provided that no compensation, either by reduction of rent or otherwise, shall become due to the lessee from Government by reason of any such operations.

4. That they will permit the Officers of Government, in like manner, to enter and do all acts and things necessary for the full enjoyment of the rights reserved to Government to and over all mines and minerals and trees and fuel-timber on the said lands.

Right of entry to enjoy mines, &c.

5. That they will not do any act inconsistent with, or injurious to, any of the rights excepted and reserved to the Government in Clause 2 of Part I of this lease, and will not in any way interfere with the lawful use by the public of any thoroughfare within the said lands.

Protection of rights reserved to Government.

6. That they will duly comply with such directions as the Deputy Commissioner of Shahpur shall issue, requiring them to construct boundary marks on the limits of the said lands, and will keep them, when erected, in good repair.

Erection of bondary marks.

7. That they will not cultivate or otherwise manage the said lands, or any part of them, in a manner calculated to injure them permanently or to lessen their value.

Husband-like cultivation.

8. That they will not assign or part with the possession of the said lands or any part thereof, except to cultivators holding of themselves, without the written permission of Government first obtained.

Not to assign without leave.

9. That they will, at the end or other sooner determination of the term, peaceably leave and surrender the said lands to the Government. The lessees will maintain and keep in repair the inundation canal "Rániwah" and cultivate the land leased to them. If they fail to fulfil the conditions the lease will be cancelled.

PART III.—Rights and Powers of Government.

It is hereby agreed between the Government and the lessees :—

1*st*.—That arrears of rent may be recovered by Government from the lessees in the same manner as arrears of land revenue may be recovered.

Recovery of rent.

2*nd*.—That if any instalment of rent shall be in arrears for fifteen (15) days or if any of the stipulations of the lessees shall not be duly observed by them, the Government may forthwith resume and take possession of the said lands as though this lease had never been granted, and the lessees shall have no right, by reason of such resumption, to recover compensation from Government for any improvement made by them, but the said lands in their improved condition shall vest absolutely in the Government upon possession being taken.

Right of re-entry for non-payment of or breach of stipulations.

PART IV.—Duties and Liabilities of Lessees.

It is hereby declared and agreed that the lessees are and shall be bound to render all such assistance in the prevention and discovery of crime as is incumbent upon land-holders by any law or rules for the time being in force in the Punjab, and are and shall be responsible in the same manner as village communities are under any track law or rules for the time being in force in the Punjab.

Police duties of lessees.

2. That if the lessees omit or neglect to perform any obligation imposed upon them by such law or rules, the Government may thereupon cancel this lease and resume the lands, as explained in Clause 2 of Part III, in addition to any penalties to which the lessees may be liable under any such law or rules.

Liability of lessees for neglect of such duties.

Part V.—Rights and Powers of Lessees.

It is also hereby agreed between Government and the lessees :—

1. That the lessees are and shall be at full liberty to sink wells, make water-courses, plant trees, build houses and otherwise improve the said lands, and to locate cultivators, and are and shall be solely entitled to all agricultural and spontaneous products not expressly excepted and reserved by this lease.

General rights of lessees.

2. That if during the term of this lease or at its expiration the Government shall resolve to sell the proprietary right in the said lands, the first offer thereof shall be made to the lessees at a reasonable price to be fixed by the Deputy Commissioner of Shahpur District and to be accepted or refused by the lessees within the time named by Government.

Right of pre-emption of proprietary right.

Provided that the said proprietary right shall not be transferred to the lessees, unless and until they shall have consented to pay the land revenue assessed upon the said lands by the proper officers of Government.

Provided, further, that the lessees shall have no right to such offer if the said lands be required for any public purpose.

3. That at the expiration of the term of this lease, and whether the land be or be not required for public purposes, the lessees shall become entitled to compensation as follows :—

Right to compensation for improvements.

All the materials connected with improvements made by the lessees to the said lands may be sold to and purchased by the Government by the mutual consent of Government and the lessees, at a price to be agreed on by them, or to be ascer-

Mode of ascertaining amount.

tained in manner provided in Schedule II. In default of such mutual consent to sell and purchase, the lessees shall forthwith remove all such materials at their own expense.

Except as is hereinbefore agreed, the lessees shall have no claim to compensation from Government for any improvement effected by them, the provisions of any Act in force for the time being as to the acqusition of land for public purposes notwithstanding.

Provided always that no such compensation shall be claimable by the lessees if the lease be renewed.

4. (That if, at the expiration of the term of this lease, a settlement of land revenue shall be in progress in the district of Shahpur and the lessees shall continue in possession with the consent of Government, all the terms of this lease shall in the absence of express agreement to the contrary, be deemed to continue in force until the conclusion of the Settlement proceedings).

NOTE.—This clause is only to be used when the lease is for the term of Settlement.

Interpretation.

In this lease the term "lessees" means and includes the said Amír Chand and Rámjowia, the heirs of Amír Chand and Rámjowia and the assigns of Amír Chand and Rámjowia or of their heirs.

The term "Government" means and includes every person duly authorized to act for or represent the Government of the Punjab in relation to any matter or thing contained in or arising out of this lease.

As witness our hands this 29th day of May 1875 at Bhera, Ráwalpindi Division, in the Punjab.

گواه شد — دستخط لایق مند ذات کهده سکنه بهیره

گواه شد — دستخط روپ چند وان گھنیالال

العبد — دستخط رام جوایا

العبد — دستخط امیر چند

(Sd.) C. R. HAWKINS,
Offg. Secretary to Financial Commissioner, Punjab.

SCHEDULE A.

Description and boundaries of the lands hereinbefore leased.

On thousand and sixty-five acres of Birbarán rukh land, the boundaries of which are on the north mauza Bhoji Koot, on the south Chak Kazi, on the east grazing ground, Bhera, on the west Rungpur Allayar.

No. 485, dated 14th October 1884.

From—J. W. GARDINER, Esquire, Deputy Commissioner, Shahpur,
To—The Commissioner and Superintendent, Ráwalpindi Division.

Private Canals.

IN reply to your letter No. 4599, dated 8th instant, I have the honor to state that the plot of land proposed to be leased to Jehan Khan in Rakh Shahpur was first reported to be 1,400 acres in extent according to settlement records (*vide* this office No. 361, dated 18th May 1877), but on being measured it was found to be 1,212 acres only, and the same was entered in the deed of lease, which was received duly signed by Secretary to Financial Commissioner, Punjab, with his No. 4282, dated 3rd July 1878.

2. The last letter from your office on the subject of transfer of Amir Chand's land in Chak Miani to Abdulla Khan, Extra Assistant Commissioner, is No. 2680, dated 12th July last.

Note by Colonel E. G. WACE, Second Financial Commissioner, on the Assessment and Management of Private Canals in Shahpur, dated Simla, 26th June 1885.

THE Senior Secretary's letter in reply to Government's No. 47, dated 18th July 1883, is based on instructions given to him by my colleague, *Colonel Davies*, to whom the case fell for disposal during my absence on leave. And it is the more appropriate that this course should have been followed, because Colonel Davies, as the former Settlement Officer and Deputy Commissioner of

Shahpur, has an intimate acquaintance with the District, and because prior to my appointment, in November last, to my present duties the case was in his charge.

2. As, however, the questions under discussion are of some importance, involving probably the future management and assessment of private canals not only in the Shahpur District, but also perhaps in the other districts south and west of Lahore, and leading up to a demand for special legislation, it appears to be incumbent on me under the Business Rules prescribed for our guidance to record my own opinion.

3. In the annexed statement I have classified the private canals, to which this correspondence relates, according as they irrigate—

(*i*) lands owned by the canal proprietors;
(*ii*) lands owned by persons who do not own the canals;
(*iii*) partly lands owned by the canal-owners and partly lands owned by other persons.

There are 19 so-called private canals, irrigating, according to the Deputy Commissioner's reports, 46,000 acres.

4. Three of these, irrigating rather more than 2,500 acres, are small cuts from the Chenab in the south-east corner of the district, such as are commonly found in any district in the vicinity of a large river. Though they are of small size, their management raises the same questions as are involved in the canals which take out from the Jhelum. There is, moreover, a great field for easy canal extension on both banks of the Chenab, although it is not yet possible to say by what agency the work will be undertaken.

5. The other 16 private canals all take out of the Jhelum, and irrigate an area of about 43,500 acres, of which, speaking roughly, three-fourths are owned by the canal-owners, and one-fourth by persons who have no share in these canals. In the case of this fourth, it is doubtful whether the irrigators can, in the existing state of the law, be assured of a continuous supply. Their only security lies in the probable willingness of the canal-owners to maintain a supply, for which so large a price as a quarter of the gross produce can be levied. Moreover, though at present only some 12,000 acres are irrigated by the sale of water, these canals are so roughly designed and organized that in the absence of some more express legal authority than at present exists it will be difficut to prevent the further growth of the system of selling water to adjacent owners for a quarter produce.

6. If the Deputy Commissioner's reports on each canal are read over, it will be seen that with two or three unimportant exceptions the excavation of these private canals was in every instance undertaken primarily by owners of land (or lessees from Government) with the object of irrigating their own lands. Each project was sanctioned or countenanced by the local authorities mainly on that understanding. I do not think it will be in the future either practicable or desirable to prohibit absolutely similar enterprises. Nor, when a scheme of this nature has been successfully executed, does it seem fair to throw too stringent obstacles in the way of a canal-owner's selling so much of his canal supply as he can spare to adjacent land owners. I am a warm advocate of the early construction by State agency of a complete and efficient irrigating system in all the country that lies between the Sutlej and the Indus. I do not believe that any other agency is likely to deal successfully with the large waste areas that the Punjab rivers command. But I would not on that account veto or discourage such small irrigating projects as are within the means of the local land-owners, and which they are willing to undertake.

7. The declaration of Government's ancient right to the use and control of the water of all rivers, contained in the preample to the Northern India Canal Act, 1873, is the only reference to the subject in the existing statutes applicable to the Punjab; and this Act does not contemplate the enforcement of this right except for the purposes of canals or drainge works under Government's own management. Seeing that Government's right to use and control all rivers stands on very ancient and unquestioned usage, it is no doubt both right and practicable for Government through its executive District Officers to take care hereafter that no cana

See Section 5 of the Act.

shall be constructed except with its consent— a consent that would be given only after the proprietors had agreed to conditions laid down by Government. But in the absence of any special law dealing with the subject, such conditions can only be enforced through the agency of the Civil Courts. And such a limitation of executive authority cannot be defended by any one who has realized how absolutely agriculture in the south-western Punjab depends on irrigation, or on the due utilization of the autumn torrents carried by the rivers and drainage channels. It is in fact a limitation which did not exist before British rule, and which has arisen rather from the neglect of the subject than from intention of the Legislature.

8. In the case of a canal or drainage work to which Government has applied the provisions of Part II of the Northern India Canal Act, the executive Revenue and Canal Officers have authority—

See Section 3 (d) of the Act.

Sections 7, 14, 15. (*i*) to enter on land and channels and do anything necessary for the application and control of the water;

Sections 16, 19, 31. (*ii*) to secure to irrigators suitable and regular water supplies;

Sections 33, 47. (*iii*) to assess and collect fair water rates and expenses of maintenance.

This legislation was evoked by the necessities of the large canal and drainage works which have been constructed by Government. But wherever agriculture is dependent on irrigation, similar necessities arise quite independently of the question whether the sole management is vested in Government; and to refer either the canal-owner or the irrigating cultivator to the Civil Courts for their adjustment is to deny the plainest necessities of the case.

9. One of the most pressing features of the case arises out of the high value which water possesses in these rainless districts. Land has little value except it is either—

(*i*) in the low alluvial, where the river floods reach it;

(*ii*) so adjacent to that alluvial that there is a water stratum near the surface supplied from the river and easily utilized by wells.

Where these two conditions do not exist (and they are absent in by far the greater part of these Doábs) agriculture is impossible, except with the aid of canals. Even in the tract irrigated by wells, the labour and cost of well irrigation is so great that the introduction of canal irrigation radically alters the conditions of the local agriculture, enormously improving and extending it.

It follows that to give to a person who is neither the Executive Officer of Government, nor himself the owner of land, authority over canal supplies is to lay the Government's revenues and the cultivator's independence both alike at the mercy of the canal-owner. As shown by the papers herewith submitted, the canal-owner forthwith demands a quarter of the gross produce; and the land-owner feeling that the canal-water is worth every thing to him submits to the demand. And we thus have in the Shahpur Canal ownership a novel tenure, which is substantially that of a middleman, exercising by virtue of his claim to quarter produce a complete authority over the land-owner's crops, at the same time as he is not himself responsible for the Government land revenue.

10. When the Government annexed the country in 1849, this kind of authority prevailed for other reasons over large tracts of country. I allude to the tenures of jagírdárs and revenue farmers who collected the Government's revenue in its ancient form of a share of the produce.

The Government then and subsequently has refused to permit the continuance of this tenure, not because there is anything inherently unjust in the levying of revenue in the form of a share of the produce, but because a middleman, who can can claim rent or revenue in this form, has the land-owner at his mercy, and not only can, but in this country frequently does, use his authority to the injury of the agriculturists and to the destruction of their rights. There is no feature in Government's policy that has given so much satisfaction and prosperity to the agriculturists as this prohibition of the demand of revenue in

the form of a share of the produce (except in cases where the land-owner himself consents to it).

11. This quarter produce demanded as the price of water by the canal-owners of Shahpur is simply the revival, in a new form and for new reasons of the justly condemned authority of an irresponsible middleman. In giving to private persons who are not owners of the land irrigated the authority to control and distribute irrigation supplies, we have assigned to them what by the ancient and still acknowledged custom of the country is a State right; and these assignees in demanding a quarter produce as water rent have merely revived and reasserted the system and methods by which a Native ruler or his jagírdárs and farmers would have levied the State's water rent. I would therefore treat them on that basis. They are assignees of the State's right. They should be subject to the same limitations in the use of that right as the State in the interests of the public fisc and of the agriculturists has imposed on itself. And in the effective distribution and control of the irrigation supply, they should receive the like support as is given to Government's own canal officers.

12. If the matter is treated on this basis, an enactment would be required giving power to Government to prohibit the construction of any new canal or drainage work and to declare the following provisions applicable to any canal or drainage work which is not managed under Act VIII of 1873:—

(*i*) powers for the acquisition of land and removal of obstructions, award of compensation and construction of embankments, water-courses and escapes and other matters coming under the general head of construction and maintenance;

(*ii*) power to provide for the due distribution of the water to the land commanded by the work;

(*iii*) power to assess and collect water rates.

The extension of the enactment to any given work should be at the discretion of the Local Government. If the abstract appended to this note is examined, instances will be seen of works which come under the head of canals, but which are too small to necessitate any control or interference by Government. But the Government should have it in its power to apply the Act wherever the necessity for its provisions are felt.

13. On the first head of the powers above proposed, I presume no detailed reasons are necessary. If a canal or drainage work exists or is acquired, there should be an effective power for its proper construction or maintenance. Speaking broadly, there is no such nuisance either to the lands commanded or to the vicinity as an inefficient or badly-constructed irrigation work. It wastes the land; it wastes the water; and is a standing source of danger and disease to the vicinity. And the authorities should be trusted to refuse expropriations and other interferences with adjacent lands where no sufficient necessity exists.

14. On the second head, we need to provide against capricious withdrawal of irrigation supplies, and also against the refusal to supply water when the demand for such supply is a reasonable one. If water is available and can be spared and cannot be supplied in any other way, the canal-owner should be required to supply it. He should not be allowed to stand off and refuse available supplies, thereby restricting equally the growth of the cultivator's prosperity and the development of the Government's revenue.

15. The third head, the power to assess water rates, involves the consideration of the State's claim both to a royalty on the water and to land revenue. I would urge that whatever water rents are produced by the construction of canal and drainage works should be treated as State revenue, that is to say, the rents should be assessed by Government's Revenue Officers and be collected—(*a*) for Government in cases where the works have been constructed at the cost of the State; and (*b*) for the owners of the works in cases in which Government has permitted private persons to construct them.

If this view is expressed in a legislative enactment, then all conflict between the claims of the canal-owners to a due return on their invest

ment and the claims of Government to land revenue and water rent, and all consequent complications of assessment likely to harass the land-owner and the canal-owner, can be avoided. The water rent or revenue, and also the land revenue, will be assessed on the same principles no matter whether the irrigation works have been constructed by Government or by private persons.

In cases in which Government has not constructed the works, we shall merely have to decide what share of the water rent, if any, is to be credited to Government.

16. In the letter to which this note is appended, as also in paragraph 10 of Government's letter* under reply, the opinion is expressed that this share claimable by Government should be so adjusted as to leave to the canal-owners a profit of 10 per cent. on their capital expenditure. I deprecate the too express adoption of this basis as a guide to the solution of this question. Most of these private canals are very badly constructed. The common belief in their cheap cost is in many cases ill founded. Where the original construction, though cheap, is faulty, the apparent initial cheapness is entirely illusive; their faults must ultimately be remedied, often thus involving a much larger aggregate capital expenditure than would be involved in originally correct construction. And above all, the capital cost of these canals is rarely known accurately, and will most certainly never be stated truly, if the Government's demand is to be less in proportion to its magnitude. The proposal, in fact, amounts to this, that Government's fisc is to be saddled with the consequences of faulty and unwise capital expenditure.

* No. 47, dated 18th July 1883.

17. Instead of this I would provide in the proposed enactment that Government will not in case of any work to which its provisions are applied demand as royalty a larger share of the water rents assessed than one-half. Under the rules applicable to works of improvement the projectors can get a protective lease, remitting even this half for a long period of years; but on the expiration of the protective lease a half of the water rent should be due to Government, unless for special reasons Government choose to take a smaller share. Cases are conceivable in which Government would take a smaller share; but this should be at Government's discretion; and Government should not be expressly required by legislative provision or by administrative rule to take account of capital expenditure over which it cannot have had any control, and the amount of which the capitalist will have every motive for exaggerating.

18. I have made the above remarks from the point of view of Government's interests; but I also object to the 10 per cent. profits rule as unfair to the projectors of these works. Government's ultimate receipt of half water rent being secured after a due interval, the owners of the work should be welcome to the other half, no matter whether it yields them 10, 20 or 50 per cent. If the works are likely to be so profitable that Government is unwilling to surrender the half water rent, Government should construct the works itself. But if it cannot do this, and private persons are permitted to put their capital into such works, they should (subject to ultimate payment of half water rent,) be made welcome to whatever returns their skill and thrift can secure.

River from which drawn.	Canals which only irrigate lands owned or leased by the Canal-owners.					Canals which irrigate lands of which the owners are not sharers in the canal.					Canals which irrigate partly lands of the Canal-owners and also lands owned by other persons.					
	No.	Name.	Constructed in A.D.	Length of bed in miles.	Acres irrigated.	No.	Name.	Constructed in A.D.	Length of bed in miles.	Acres irrigated.	No.	Name.	Constructed in A.D.	Length of bed in miles.	Acres irrigated.	Of which not owned by Canal-owners.
Chenab ...	...	...	...	...	...	...	...	...	...	...	1	Mukhdumwah ...	1866	10	1,750	1,000
											2	Thattiwála ...	1881	4	500	250
											3	Mokhanwála ...	1865	5	312	162
Jhelum ...	5	*Amirchandwála ...	1865	15	2,000	4	Sahib Khan and Pir Haidar Shah ...	1871	9	† 2,500						
											8	Sultán Mahmud ...	1863	10	3,496	1,481
	7	Malik Fatteh and Hathim ...	1866	15	4.000	6	Malik Jenán Khán...	1868	9	250	9	Nagyana ...	1870	3	350	150
						10	Sahibkhanwala, new	1871	3	463						
											11	Sahibkhánwála ...	1861	10	13,348	2,348
											12	Mikanawáh ...	1870	17	3,539	789
	15	Jhannuatanwála ...	1865	3	211						13	Chilwala ...	1864	22	5,023	1,323
	16	Nathuwála ...	1869	5	858						14	Sarfarázwála ...	1866	16	5,421	1,183
	17	Kundanwála ...	1869	2	292											
						18	Mahotawala ...	1862	...	500						
	19	Sher muhammadwála	1873	13	1,215											

* The owner's venture has ruined him, and he has thrown up his lands, and the canal is not now working.

† But the canal-owners hold 500 acres in mortgage.

No. 62, dated 28th September 1885.

From—H. C. FANSHAWE, Esquire, Offg. Junior Secretary to Government, Punjab,
To—The Offg. Senior Secretary to Financial Commissioner, Punjab.

I AM directed to acknowledge the receipt of your letter No. 774 of 10th July, forwarding the opinions of the Financial Commissioners regarding the management and treatment of the private canals in the Shahpur District, and in reply to convey the following observations :—

2. The Lieutenant-Governor has read these papers with much interest, and is of opinion that it will be convenient to take the present opportunity to state fully the principles on which the development of private canals should be encouraged generally in the Punjab, in order that they may be embodied either in the Northern India Canal Act when revised, or in a special legislative enactment. When these principles have been laid down it will not be difficult to indicate how far in the opinion of His Honor the private canals in the Shahpur District should be treated in accordance with them, due regard being had to the special circumstances of the past; and the subject will accordingly be treated in the above order. Indications of the general policy which should be pursued with regard to private canals have already been conveyed to the Financial Commissioner in the orders regarding the Shaukatwah Canal in the Fázilka tahsíl of the Ferozepore District, and in the Resolution of the Lieutenant-Governor upon Colonel Grey's manual for the construction of district canals, and it will now be convenient to deal with the whole subject together.

3. In the first place, the Lieutenant-Governor considers it essential that in the forefront the right of Government in the water should be clearly and decidedly set forth in every case, and that for this purpose a royalty, as distinguished from water-rates and revenue assessment, should be taken on every private canal, old or new, upon the amount of water supplied. The rate may be purely a nominal one, but it is important to take it, and it should be levied on all private canals, whether constructed by middlemen or by single owners or by village communities. In all cases in which no such royalty has been taken hitherto, it should be imposed at the time of settlement, or, if this is not equitable with reference to the conditions under which any particular canal was made, on the expiry of the term of the concessions made by Government to the constructor of the canal. On Government canals the question of royalty does not of course arise. But in private canals it is as important as rents on property, and the Lieutenant-Governor agrees entirely with the views expressed on this point by Colonel Wace in paragraphs 6—10 of his memorandum.

4. In the second place, as regards the construction of private canals, it is necessary to insist strongly on the following three points :—

(1). It is requisite that the approval of Government should be obtained to the scheme, including the general alignment and plan of the proposed canal, and to the terms on which the constructor is prepared to undertake his work.

(2). It is requisite that, after such plans and conditions have been approved, Government should have power to exercise on behalf of the projector of the canal all the powers of entry, acquisition of property and the like, which Government can avail itself of for the construction and maintenance of its own canals. These powers should extend to all classes of works connected with irrigation, such as embankments, escapes and the like, as well as to the actual canal.

(3). It is requisite that Government should have power to require the projector to do everything necessary for the public convenience in regard to crossings, the non-obstruction of drainage lines and the like, in the same way as in the case of Railway Companies.

5. In the third place, when the canal has been constructed, Government requires power—*first*, to fix the maximum of water rates which must not be exceeded; *secondly*, to regulate the distribution of the water, both in respect

to the supply to lands favourably situated and to prevent the arbitrary withdrawal of supplies once given ; and *thirdly*, to assume the management of the canal in certain cases of mismanagement or incompetence on the part of the proprietor. On the other hand, Government should have power, where it receives a share of the water rate, to collect the rates payable to private owners as if they were arrears of land revenue, though His Honor thinks that this power should not be exercised where Government does not receive any share of the water rates. If these powers are well defined and are made sufficiently extensive, it will be a matter of no consequence in future whether the canal-owner is also a land-owner or is merely a capitalist who desires to devote his capital to becoming a seller of water.

6. The term of exemption from payment of water rates or of wet land revenue assessment, and the share of the water rate to be taken by Government after the expiry of the term of exemption, will be settled in each case in accordance with the principles laid down in the Land Improvement Act, and it is not necessary perhaps that any special provisions of law should be made on this point in connection with private canals. As a rule the period of exemption from the payment of share of water rate to Government would probably be longer than the period of exemption from the payment of land revenue. The Lieutenant-Governor agrees with Colonel Wace that in no case should Government demand a larger share than one-half of the water rates levied by the canal-owner, and in practice this share will no doubt almost invariably be considerably less than half. It is not necessary to add more on this point in the present place, as the question should be considered in connection with the periods of exemption for taxation to be fixed for all classes of improvements under the provisions of Act XXI of 1883. The assessment of the land irrigated by the canals will be a dry assessment in accordance with the principle now invariably adopted in the Punjab. The canal rates will be altogether distinct from the assessment, and the Government's interest in the canal will be a share in the canal rates rather than an additional assessment on the land.

7. The Lieutenant-Governor thinks that the Financial Commissioner will not find it difficult to draw up a brief legal enactment in accordance with these principles, and on further consideration of the question His Honor would prefer that a separate enactment for the construction, management and control of all classes of private canals in the Punjab should be prepared and submitted to the Government of India. The present Canal Act applies to the whole of North India. Any modification of it will therefore necessitate references to other Governments, and a general measure may result which will not be altogether applicable to conditions in the Punjab. It is understood that private inundation canals form a peculiar feature of this Province, and that similar works of any magnitude do not exist in any other Province of North India. The question of the revision of the Canal Act with reference to the question of private canals in the Punjab has now been under consideration for nearly three years, and His Honor would be glad to see the latter brought to a satisfactory conclusion independently of the former, if the Financial Commissioners see no strong objection to this.

8. How far these principles can be applied in the case of the Shahpur canals must depend on the conditions under which permission was given in each case for their construction. It will be necessary that the Settlement Officer should report separately on each canal at the time of settlement when the orders of Government should be taken on each. The Government has no desire to check the sale of water on existing private canals; but on grounds of public policy it is necessary that Government should regulate the relations between canal-owners and water purchasers, and this must be arranged for at settlement. Similary, Government has no wish to stop the water-supply of the Shahpur canals; but Government has a right to tax the water used and to claim a share in the profits of its use, and this right must be asserted at the time of next settlement. For the present it will be sufficient to let the canal-owners of the Shahpur District know on what principles the Government proposes generally to proceed in dealing with their case at settlement, so far as they are not inconsistent with existing agreements and would not work unfairly to the canal proprietors. Meanwhile extensions of canals or the increase of the volume of

water carried by them must be forbidden, and no alterations involving a material change in their constitution should be permitted without the previous sanction of the Local Government. The precise orders which may be issued in the case of each individual canal cannot be decided until the separate reports are received from the Settlement Officer, and this subject should be taken up and disposed of at an early period in the operations of the settlement. The Lieutenant-Governor agrees with the views expressed by Colonel Davies in paragraph 11 of the letter under reply as to the manner of recording existing rights in the lands occupied by the canals. The present orders should *mutatis mutandis* be made applicable to the case of the Ferozepore Inundation Canals as well, and a copy of the present correspondence should be communicated to the Settlement Officer, Ferozepore, for information and guidance in this matter.

9. As regards the minor points noticed in connection with the canals of the Shahpur District, I am to convey the follow observations:—.

It is understood that the Crobynwah Canal has been put into proper order, and that it is now working satisfactorily. It is not understood why the Government canals on which water rates are levied should be cleared in any way by forced labour, and this practice should cease. The clearance of these canals is, as far as known in this office, effected by means of paid labour, and there is no reason why a sufficient budget estimate to cover the full cost of clearance by paid labour should not be submitted by the Deputy Commissioner each year for the sanction of Government. The District Officer should inquire of the various private canal-owners of the district if they are willing to combine to pay for three-fourths of the cost of a professional survey of their canals, the remaining one-fourth being defrayed from provincial revenues. A separate reply should be given on this point at an early date, in order that if owners agree arrangements may be made for the deputation of a Surveyor during the ensuing cold weather.

10. As regards the Ràniwah Canal, it is impossible for the Local Government to do any thing at present. But should the Government of India consent to purchase the Amritsar-Pathankot Railway from the Punjab Government, it is possible that funds may be made available for the development and improvement of the Ràniwah.

11. The enclosures of your letter under reply are returned herewith.

SECTION IV.

MISCELLANEOUS.

A

Papers on the duty of Canal Water in the Bari Doab Canal.

NOTE on Irrigating duty of Bari Doab Canal. [*Vide* Plates I, II and III, by R. G. KENNEDY, Esq., Executive Engineer, Bari Doab Canal.

1. *Absorption and Evaporation compared.*—The duty of any canal must of course be inversely as the loss of water, the causes of which may be divided into absorption, evaporation and waste. Of the first two, by far the greater loss is caused by absorption, that from evaporation even in the hottest months being only a small fraction thereof. The Roorkee Experiments show that it only amounts to $\frac{1}{10}$th inch, or 0·008 of a foot per day. The mean of several observations taken on Bari Doab Canal last hot weather (the vessel being placed in a running watercourse) gave 0·015 foot per day, whereas as shown hereafter the minimum absorption in any case is about 0·16 per day. The rate of absorption is in future denominated by c, being the depth in feet absorbed in one hour (that being the most convenient unit,) and may also be taken as including evaporation.

2. *Variation of c.*—Now the value of c will not remain constant for any flooded area, but decrease as the time increases, and to determine this rate of decrease, the following experiment taken on Changa Manga plantation is given. A plot of 27,000 square feet of forest land was enclosed by bunds and flooded very rapidly (in a few minutes) to a depth registered on a gauge, and the supply shut off. As soon as fresh supply was required water was again run on, the reading before and after being taken, and a correction allowed for the time taken in flooding. The experiment lasted eight days, the area outside the bund being also kept flooded, and the depth of water inside varying from 0·20 to 1·00 foot. The gauge readings taken from time to time gave the result shown here as a curve, (*Fig.* 1,) the ordinates being the total number of feet absorbed in depth in the number of days shown by the abscissæ. The equation $y = 1{\cdot}37x^{\cdot 86}$ in feet and days, or $y = 0{\cdot}0891x^{\cdot 86}$ in feet and hours nearly represents the curve. The index of this equation probably expresses the law of increase of resistance to filtering of water (by capillary attraction helped by gravity) as the depth of soil through which it has to be forced increases, *i. e.*, as the time increases. The constant in the equation probably depends on the nature and dryness of the soil. The ordinates give the total depth absorbed since the commencement, hence the rate of absorption at any time x is $c = \frac{dy}{dx} = 0{\cdot}0891 \times 0{\cdot}86x^{-\cdot 14}, = 0{\cdot}0766x^{-\cdot 14}$, from which we can deduce the probable value of c at any time greater than eight days. Thus we get—

Time.	c.
One week	0·0370
One month	0·0305
One year	0·0215
Two years	0·0195

These figures are of course only probable, but serve to show how slowly the rate decreases. From the curve it is evident that no appreciable error will be incurred if for short periods of say a few hours we take c as constant, and this is accordingly done in "kiari" experiments described hereafter. The value of c at the end of the first hour deduced above may be taken as the probable maximum

for the loamy soil general in this Doab, experiment having been during driest time of year, and the plot not irrigated for a year previous.

3. *Value of c on fields.*—On ordinary fields the value of c on being first flooded seems to depend for the same class of land on the amount of moisture already in the soil. Thus in last November, *i.e.*, two months after last fall of rain, the general value of many measurements taken in various localities was 0·04 to 0·05. On the second watering of Rabi a month or so later, the general value was 0·02 to 0·03, and about the same on the third watering. On sandy soils, however, it would doubtless be much more.

4. *Value of c on watercourses.*—We may find the value of c on a channel as well as on a field, and at any rate for small channels, it affords the best way of determining the loss. Thus let there be a discharge D in cubic feet per hour entering a channel of average surface breadth b and length l; then if we actually measure c on still water, bunded up where necessary to the mean usual depth, it is evident that the value so got will sensibly be the same as when the water is flowing, the steps in level of water so caused being always very small even when the bunds are 1,000 feet apart. The total loss then will be $= bcl$ per hour, and the percentage of loss will be $= \frac{100\,bcl}{D}$. The latter, however, though usually adopted, really shows nothing, as on the supply or velocity being increased the loss remains pretty much the same, but the percentage diminishes. As on fields the value of c will not be constant, but decrease the longer water has been flowing. On channels always full, it will tend to reach a limiting value when once the filtering has reached the spring level; but on the channel being left dry for any time, its value on re-admission will be at first high, and gradually diminish to its former value. Thus we may expect c to be smallest on main canal, larger on rajbahas, and largest on watercourses. On the latter the actual value of c is greatest on a newly opened one, and then often amounts to 0·11; it is least on those always running sometimes as low as 0·015, and greater on the small branches only occasionally used a very common value being 0·05. The average value as ascertained by 63 actual measurements equally distributed at beginning, middle and end of watercourses in various localities is 0·034.

5. *c on Rajbahas.*—On rajbahas the value of c is more difficult to determine, but those measurements got show a steady increase as we go down the stream, owing to the upper part having a constant supply, the lower being often only full on certain days of the week. Thus the minimum value of c was 0·0077, increasing to 0·011 and 0·016. The probable mean value may be taken as 0·012.

6. *c on Canal.*—On main canal it is impossible to obtain values of c direct, but it may be deduced from former experiments. Thus in main branch lower, in a length of 63 canal miles, of average surface width 67 feet, Mr. Higham observed that the loss was 46·15 cubic feet per second $=$1,66,140 cubic feet per hour. The total surface area was $63 \times 5{,}000 \times 67 = 2{,}11{,}05{,}000$ square feet. Hence to find c we have—$2{,}11{,}05{,}000 \times c = 1{,}66{,}140, \therefore c = 0{\cdot}00787$. On Kasur and Sobraon branches, Mr. Benton found that loss was 22 cubic feet per second $=$79,200 cubic feet per hour, the total surface area between discharge sites having been 99,55,000 square feet. Hence $99{,}55{,}000 \times c = 79{,}200$, $\therefore c = 0{\cdot}00795$. From the close agreement between these two results, we may take $c = 0{\cdot}0079$ for the lower branches of canal, except of course when newly opened after a closure. For the upper reach we may expect c to be greater, owing to the soil being full of boulders, and the presence of springs fed by canal water. Thus in first 52 miles the loss observed by Mr. Higham was 272 cubic feet per second $=$ 9,79,200 cubic feet per hour. The mean surface width being 107 feet, the total surface was $52 \times 5{,}000 \times 107 = 2{,}78{,}20{,}000$, and $\therefore 2{,}78{,}20{,}000 \times c = 9{,}79{,}200 \; \therefore c = 0{\cdot}035$ or more than four times that of lower reaches.

7. *Actual loss on Canal proper.*—Having now ascertained the values of c, we can deduce the actual loss caused by the same; which may be divided into—loss on main canal, on rajhbahas and watercourses.

Name of Branch.	c.	Length in canal miles.	Surface breadth.	Surface area.	Totals.	Loss in cubic feet per hour.	Loss in cubic feet per second.
Main Line, Madhopur to Aliwal	0·035	55	107	2,94,25,000	2,94,25,000	10,29,875	286
Main Branch Lower ...	0·0079	93	64	2,97,60,000			
Lahore Branch ...	...	60	45	1,35,00,000			
Kasur Branch Upper ...	...	7·5	50	18,75,000			
Kasur Branch ...	...	61	27	82,35,000			
Sobraon Branch ...	..	31	23	35,65,000	5,69,35,000	4,49,786	125
Total loss on Main Canal in cubic feet per second=							411

From this Table giving loss on canal proper, it seems that compared with upper reach, the loss on all lower branches is insignificant. To put the result just got in another form. In rabi 1881-82 the mean discharge entering Bari Doab Canal taken over the time it was open from October 1st, 1881, to March 31st, 1882 (having been closed 39 days) was 2,036 cubic feet per second. Deducting 411 we have 1,625 as the quantity entering rajbahas, *i. e.*, out of every 100 cubic feet entering the head only $\frac{1625 \times 100}{2{,}036} = 80$ cubic feet nearly reached the rajbaha heads. A check on this result is got thus—During same crop the discharges of four rajbahas (Bachee, Thamman, Handal and Tarkwind) whose section at the head during that time varied but little were observed, discharge curves drawn and the mean discharge deduced for the six months above mentioned in the same way as for the canal in para. 10 hereafter. The united mean discharge of the four was 236 cubic feet per second, and (also as in para. 10) the area irrigated was 36,500 acres. Hence the mean depth of water which would have been spread over this area from October 1st to March 31st (182 days) would have been $\frac{236 \times 182 \times 24 \times 60 \times 60}{36500 \times 43560} = 2.334$ feet. But in para. 10 it is shown that, as measured at Madhopore, the mean depth was 2·947. Hence, assuming that the efficiency of these four rajbahas is the same as that for the whole canal and that the relative proportion of each crop was also so, we deduce that out of 100 cubic feet entering canal only $\frac{2{\cdot}334 \times 100}{2{\cdot}947} = 79$ say enters the rajbahas, which is remarkably close to result independently arrived at.

8. *Loss on Rajbahas.*—The total water surface on rajbahas being unknown, an average rajbaha is assumed, whose data are as follows deduced for rabi 1881-82. Average discharge entering will be the total quantity as above found divided by the number of rajbahas, *viz.*, $\frac{1625}{69} = 23$ cubic feet say. The mean surface width deduced from data available seems to be 10·5 feet, and the mean length deduced from known total mileage is close on 11 miles. But as some of them are only full on their whole length on certain days of the week, the mean length always running may be taken as 10 miles. Hence on this assumed average rajbaha, taking $c = 0{\cdot}012$, we have the loss$= 10 \times 5{,}000 \times 10{\cdot}5 \times 0{\cdot}012 =$ 6,300 cubic feet per hour$=$1·75 cubic feet per second out of 23 cubic feet; and thus out of our 80 cubic feet (above found), we will lose $\frac{1{\cdot}75 \times 80}{23} = 6{\cdot}09$, or say 6 cubic feet: leaving $80 - 6 = 74$ cubic feet of our original 100 to enter the mogas.

9. *Loss on Watercourses.*—In the same way we must assume an average watercourse whose discharge is to be found from total quantity entering rajbaha divided by number of mogas supplied. This has been done for five rajbahas, giving a mean discharge of 0·52 cubic foot per second, which as above would be reduced to $\frac{0{\cdot}52 \times 74}{80} = 0{\cdot}48$ cubic foot at the moga head. The mean length of

watercourses has been deduced from a plan of all the channels on one rajbaha giving the average distance water is carried as close on 4,000 feet. The mean surface width is 3·6 feet arrived at from 16 *average* breadths measured. The value of c as given in para. 4 being 0·034, the loss on such a channel is $4{,}000 \times 3{\cdot}6 \times 0{\cdot}034 = 489{\cdot}6$ cubic feet per hour=0·136 cubic feet per second; therefore on our 74 feet we shall lose $\frac{0{\cdot}136 \times 74}{0{\cdot}48} = 21$ cubic feet say, leaving $(74-21) = 53$ cubic feet arriving at the fields.

10. *Loss by waste.*—To arrive at any estimate of the last cause of loss —waste, we must know what depth of water is required for a crop. Still keeping to rabi 1881-82, we find that from October 1st to March 31st the canal was closed 39 days from January 13th, and open 143 days, with an average supply, after deducting escapes and forest rajbahas, of 2,016 cubic feet per second actually used on irrigation, the total area irrigated being 2,41,129 acres. Now had there been no rain, and the closure impossible, the mean discharge would have been somewhat less, say 2,000 cubic feet, but the irrigation would hardly have been increased at that time of year, especially as the supply then was not sufficient to meet the demands for the crops already entered in the books. At the outside it would not have been more than 2,45,000 acres. Taking these figures, we have the mean depth which would have been spread over this area (had there been no loss) in 182 days$=\frac{2000 \times 182 \times 24 \times 60 \times 60}{245000 \times 43560} = 2{\cdot}947$ feet. The total area is here divided approximately from irrigation returns into three classes, *viz.*, those needing one, four, and five waterings, and these include all but a very small percentage of the rabi crop grown. Opposite each is entered the minimum possible yet sufficient depth required to bring it to maturity as given hereafter in para. 20, and from these on working out we find the mean depth required to be 0·815. Thus we have that out of 100 cubic feet entering canal, only $\frac{0{\cdot}815 \times 100}{2{\cdot}947} = 27{\cdot}6$, or say 28 cubic feet, would have been sufficient, had there been no loss, to do all the irrigation.

Name of Crop	Area in acre.	Number of waterings.	Minimum depth of waterings.
Wheat, barley &c.	1,88,000	4	0·883
"Suji"	30,000	5	0·875
Gram, "wanh," &c. ..	27,000	1	0·286
Total, ...	2,45,000	mean depth	=0·815

But as we have asserted that of this 100 cubic feet only 53 reach the field, the waste must be $53-28 = 25$ cubic feet.

11. *Final abstract of Loss.*—To repeat then we have the result that out of every 100 cubic feet entering the Bari Doab Canal during rabi 1881-82, 20 were lost in canal proper, 6 in rajbahas, 21 in watercourses, 25 by waste in various ways, and 28 could have done all the useful work of irrigation. That is to say, that considering the canal as a machine, its efficiency was 28 per cent.

12. *Discharge available at fields.*—Before going on to describe experiments undertaken to find cause and remedy of waste just given it will be well to ascertain what is the discharge generally available for watering fields. As in para. 9 the mean discharge entering a moga is 0·48 cubic foot, and this would be reduced to $\frac{0{\cdot}48 \times 53}{74} = 0{\cdot}344$, which may be taken as average discharge at field for flow irrigation.

On "jhalars" raising either canal or well water, the discharge of course decreases with the depth and the result of many measurements is shown in *Fig. 2, Plate I.*

The ordinary height which canal water is raised is 4·5 feet, and average discharge is then 0·21, though it varies very greatly as shown by the sloping lines; ordinates to upper giving maximum, to middle mean, and to lowest the minimum. The principal cause of this variation lies in the bullocks, but also partly in the efficiency, which as found varies from 50 to 60 per cent. The limiting height which water can be thus raised seems to be about 85 feet, *i.e.*, when D=0.

13. *Kiári Experiments.*—*Fig.* 5, *Plate* I, shows site of the experiments now detailed, the object being primarily to find the relative quantity of water required to water fields without any subdivisions or "kiáris" and with "kiáris." Thus field A had no subdivision, and B on the other hand had 24 each, having an area of 1,327 square feet, *i.e.*, about the size prescribed (36′ × 36′), the full discharge being turned alternately into each one. In both A and B the supply was cut off on reaching the further side, *i.e.*, the watering was the minimum possible in each case. Fields C, D and E were watered so as to show the effect of heavy and light flooding; thus C got very heavy waterings, D somewhat less, and E very light, special means being adopted for the last. These three fields had also "kiáris," but their only object was to get uniformity in the depth given. Field F was left entirely to the owner; he making his own "kiáris" as shown, and getting as much water as he wanted, so as to show the usual depth taken, and the effect of filling from one compartment into another the usual method of the cultivator. All the area under experiment had been ploughed, several times during last monsoon, the first watering before sowing being on this rough surface, the effect being shown in the greater depth required. On partly drying the land was again ploughed, seed sown (all wheat), and slightly levelled of with the "swaga." On this the second watering is given, leaving the ground caked and uneven for the third watering, by which time it had also become much cracked by contraction. After this no change can be effected in the surface, and other things being equal, the fourth, fifth, &c., will be the same as the third. The discharge in supply channel was gauged by two triangular notches, each of depth 0·5 and surface width 1·0, with a free fall giving a discharge of 0·91 for both, which was also checked by turning into a tank. The supply head was constantly watched and level kept fixed on temporary gauge. The nearest point of fields being 600 feet distant, a correction had to be allowed for absorption, varying for each field and slightly with the time the watercourse had been running. This was found as already described, resulting for both notches in giving discharges only varying very slightly from the following—0·79 cubic foot per second for A and B, 0·80 for C, 0·81 for D, 0·82 for E, and 0·81 for F. The time was carefully noted for each field, and thus the average depths of water given in following table deduced :

Names of Fields.

	A.		B.		C.		D.		E.		F.		REMARKS.
	Depth of watering.	Dates.	Depth of watering.	Dates.	Depth of watering.	Dates.	Depth of watering.	Dates.	Depth of watering.	Dates.	Depth of watering.	Dates.	
Area in square feet, ...	33,700		31,850		19,800		21,000		18,600		79,700		
First watering,	·357	4-11-82	·272	4-11-82	·418	5-11-82	·320	5-11-82	·220	5-11-82	·355	15-11-82	
Date of sowing,	..	15-11-82	...	15-11-82	...	17-11-82	...	17-11-82	...	17-11-82	...	28-11-82	
Second watering	·284	28-12-82	·240	27-12-82	·400	29-12-82	·303	29-12-82	·230	29-12-82	·210	...	
Third watering,	·210	..	·210	...	·210	...	·210	...	·210	...	·263	16-3-83	Branch closed from 1-2-83 to 11-3-83. Rain (shown in oldstyle figures thus ·210) being 0·3 on 10-1-83, ·5 about 25-1-83 and ·03 on 5-3-83, total 0·21 foot. Last rainfall ·030 on 2-4-83.
Fourth watering	·200	15-3-83	·172	15-3-83	·343	15-3-83	·298	15-3-83	·169	15-3-83	·030	...	
Fifth watering (rain) ...	·030	..	·030	...	·030	..	·030	...	·030	...	...	...	
Total depth of water, ..	1·081	...	·924	...	1·401	...	1·161	...	·859	...	·858	...	
Date of cutting crop, ...	...		Crops all cut between 28th April and 4th June.										
Outturn grain in md. per acre	23·04		22·80		17·82		17·53		17·83		13·15		
Outturn straw do. ...	31·31		32·43		23·96		26·34		25·67		16·64		
	No kiaris ...		Kiaris ...		Heavy flooding kiaris ...		Moderate flooding kiaris ...		Light flooding kiaris ...		Zamindari management ...		

Comparing A and B, we see that A took a total depth of 1·081 as against 0·924 of B, the greatest difference being in the first watering owing to c being then 0·04, and only 0·02 or thereabout afterwards. The total difference would have been somewhat more had there been no rain. To judge from appearance there is no difference in the crops of the two fields. The same is also the case (among themselves) with C, D and E, and as it was found that C and D required as many waterings as E, there is no advantage in heavy flooding, but probably the reverse. On F the crop is inferior in appearance to that of C, D and E, which again is inferior to A and B, which had been manured about two years ago. The first watering of F by the owner (without any subdivisions) would have been much heavier had the value of c not been small (0·018) owing to an accidental previous flooding. The kiáris shown in F were only made after sowing, and the effect of filling from one into another is shown in the third watering 0·263, which would only have been 0·172 had proper kiáris been made. The reason of total water on F being so small lies of course in only two actual waterings being given, owing to different date of sowing, and the last rain 0·03 being enough in its then advanced state to bring the crop to maturity. Had there been no closure, one if not two extra floodings would have been given it.

14. *Method of flow over a field.*—The above experiments show that the minimum possible watering, *i. e.*, only just enough to cover the area, is sufficient for all purposes, hence we now proceed to find what this is under different conditions. To do this we must know something of the theory of flow over a field. Let there be a discharge (*see Fig.* 3) D in cubic feet per hour entering at O, a field of uniform breadth b, whose rate of absorption is then c, and those original surface before being ploughed up is represented by OX supposed horizontal, as the slope on nearly all fields is so small, that the owner himself can seldom say which is the higher side. The water will be expended in three ways—*1st*, it will fill up hollows under the clods to a depth e say shown hatched in *Fig.* 3, and remain there imprisoned by the subsidence of the now moist soil; *2nd*, it will head up to a varying depth y as shown by the curve convex upwards thereby gaining the necessary slope to enable it to move onwards; the discharge thus passing forward through a rectangular section of breadth b and depth y; *3rd*, it will be absorbed all over the area covered, and the absorption at any point will be proportional nearly to the time that point has been under water, being thus greatest at O.

15. *Value of e.*—The value of e is greatest on a newly ploughed field, and would of course increase with the depth of ploughing. For ordinary native plough, the maximum value is 0·21 foot as deduced from what follows and experiments in para. 13, which value may be used for first waterings on "wanh." For second waterings when generally more or less dressed by the "swaga" after sowing, e varies from 0·12 to 0·18 according to the labour expended. For third waterings e goes to fill up cracks and holes on the now caked surface and varies from 0·05 to 0·11 foot.

16.—*Values of y and d.*—Let the depth of water over OX at any distance x be y, then the ordinary formula $v=C\sqrt{rs}$ may be applied to find the velocity there. Since b is always very large compared to y, we can write $r=y$, and for s we write $-\frac{dy}{dx}$ *i.e.*, the tangent of the inclination with OX. The value of C for ordinary fields has been found by actual levelling to be about 40 or using an hour as unit of time, 3,600 × 40=1,44,000, called in future m. With this notation it is shown in para. 22 that when the water has reached the length l from the origin, the equation of curve of surface of water is $\frac{y^4}{4} = \frac{(D-bcx)^3-(D-bcl)^3}{3\,b^3\,m^2\,c}$. But for all ordinary cases, where loss by absorption is small compared to D, the equation $\frac{y^4}{4} = \frac{D^2\,(l-x)}{m^2\,b^2}$ gives values of y agreeing with the above to the third decimal place, hence we may employ the latter when area watered at one time is of reasonable size. From it we deduce (*see* para. 22) that the heading up at origin is $=\left(\frac{2D}{mb}l\right)^{\frac{1}{4}}$, and the mean heading up or the mean

value of y, hereafter called d, is $d=\frac{4}{5}\left(\frac{2D}{mb}l\right)^{\frac{1}{4}}$. That is to say, the area bounded by curve and OX is $\frac{4}{5}$ths of the circumscribing rectangle. *Fig* 6 shows values of d by inspection for a field 50 feet wide under varying values of D and l. The value of d is supposed plotted vertically to the plane of the paper forming a surface on which curves are contours. It will be seen that d increases very slowly with l, and that for ordinary cases, as e is generally much greater than d, the error incurred by assuming $(e+d)$ constant will be very small.

17. *Time of watering and mean depth.*—Thus we may now assume as approximate a uniform depth $=(e+d)=h$ in future being spread over the field, and absorbed as it goes. The time taken to cover any area $A=bl$ is proved in para. 22 to be in hours $t=\frac{2{\cdot}3h}{c}\log\frac{D}{D-Ac}$ using common logs, and the mean depth expended in covering the same area is $z=\frac{2{\cdot}3hD}{Ac}\log\frac{D}{D-Ac}$ from which the accompanying diagrams (*Plate* II.) have been calculated for a value of $h=0{\cdot}27$ (being the probable maximum), and for values of $c=0{\cdot}02$, 0·04, 0·06 and 0·08. On these may be read off the mean depth required to cover any area under discharge for a first watering, *i.e.*, the value of e has been taken as 0·21 and d as 0·06, which as checked by levelling is nearly true. The portion covered with radiating lines is a surface concave upwards, on which the radiating straight lines are contours at heights giving value of z. When $D=Ac$, z becomes infinite (as then the area would never be covered) as shown by the four radiating dark lines which are traces of vertical planes tangent to the surfaces. As an example take first watering of A—here area =33,700, c was 0·04, and $D=0{\cdot}79$. Reading off we find $z=0{\cdot}366$, agreeing as closely with actual value 0·357 as can be expected, seeing that all fields are more or less uneven. In the same way eight or ten actual values of z were tested and found to agree very fairly sometimes more and sometimes less. For a second watering as already given e varies from 0·12 to 0·18, being smallest on jhalár irrigated land, where most labour is spent, and keeping $d=0{\cdot}06$, we thus find h varying from 0·18 to 0·24 and for any given value in using the diagram the reading must be multiplied by the ratio of h to 0·27. In the same way for a caked surface or third watering h varies from 0·10 to 0·17; 0·10 being thus the smallest possible depth which can ever be put on an ordinary field. This agrees with several waterings checked on jhalár land, carefully dressed, and where d is probably not more than 0·05 at the outside. If in any case a closer approximation was required the breadth of the field being given, it would be necessary to find value of d from its diagram (remembering that it is inversely as the root of the breadth), and add to it the value of e before using second diagram for z.

18. *Best size of Kiáris.*—Looking at diagram of values of z, it is at once seen that present size of kiáris is too small. Thus for first watering of B, $h=0{\cdot}27$, $D=0{\cdot}79$, $A=1{,}327$, $c=0{\cdot}04$, we find $z=0{\cdot}272$, *i. e.* only 0·002 mean depth was absorbed during watering of each kiári. The larger the "kiáris," the more likely they are to be made by the cultivator, and less area he loses by the minor watercourses. With the present size this loss may often amount to 3 per cent. of field. As regards the shape, the wider the compartment for a given area the less the value of d, and hence the less the value of z, but on the other hand the wider the "kiári" the more loss of land taken up for channels. Thus perhaps the best shape would be square, even had we "kiáris" 70′ × 70′=4,900 square feet, with the average value of $D=0{\cdot}35$ say, and $c=0{\cdot}04$ (the probable maximum), we see that the value of z would be 0·291 or a loss of 0·021 all over. For second waterings $h=0{\cdot}24$ and $c=0{\cdot}02$, $z=0{\cdot}249$ or a loss of 0·009: for third waterings $h=0{\cdot}17$ and $c=0{\cdot}02$, $z=1{\cdot}076$, or a loss of 0·006. Hence when this discharge can be secured and soil is not very sandy, "kiáris" of this size do not seem excessive, and then the minor watercourses might be made permanent 140 feet apart.

Fig. 4 shows what would still further reduce the quantity of water required to water each "kiári" if it could be carried out. Thus on No. 1 being

covered, the surplus water of depth d on it might be allowed to flow through the opening a_1, and so help to water No. 2, the supply in the latter being cut off on the two waters meeting. a_1 would then be closed and a_2 opened, and the same go on in No. 3. For a jhalár of low lift, where $D=0{\cdot}20$, a "kiári" of 2,000 square feet, or say $45' \times 45'$ might be best. For a well raising 0·10 cubic foot, an area of 1,000 square feet, or $30' \times 30'$, would be the most suitable perhaps.

19. *Best value of* D.—If we were to turn an extremely large discharge into a field of given breadth, it is evident that it would head up very much to force itself onwards, *i.e.*, the value of d, and therefore z would be great. On the other hand if we use a very small discharge the time taken will be long, and hence loss by absorption will be large. From this it is evident that for an area of given dimensions and values of c and e, there must be some value of D, say D_o, which will cover it with the least expenditure of water, *i.e.*, a discharge of greatest duty. In para. 22 it is shown that this value of D is to be found from the equation $2{\cdot}3 \log \frac{D_o}{D_o - Ac}\left(e+\frac{3}{2}d\right)=\frac{Ac}{D_o - Ac}(e+d)$, when d itself is a function of D_o. This can only be solved by trial, and the results for kiáris $70' \times 70'$ and $c = 0{\cdot}04$ are here given. Thus for this size of compartment there is no advantage but the reverse in ever having a greater discharge than 0·451, and as the value of D_o for "kiáris" $36' \times 36'$ will be less than those given, we see that under certain conditions the latter would actually need more water than the former, the heading up being more. If $e = 0$ by trial, we find $D_o = 1{\cdot}9\ Ac$ (196 in above case), *i.e.*, if we could have a field (not very marrow) perfectly smooth and level, the most economical discharge in cubic feet per hour would approximately be 1·9 times the amount absorbed over the whole area in one hour.

	Value of e.	D_o in cubic feet per hour.	D_o in cubic feet per second.
First watering ...	0·21	1,630	0.451
Second ,, ...	0·15	1,400	0.388
Third, fourth, &c....	0·10	1,050	0.291
	0·00	196	0.054

20. *Minimum depth possible for each Crop.*—The first statement here shows the minimum possible depths for each watering supposing we used "kiáris" $70' \times 70'$, and a discharge 0·45 cubic foot per second, taking for each class the maximum value of e. From this has been deduced second table giving total minimum depths required for the most common crops. Thus for wheat, &c., the depth = ·286 + ·247 + ·175 + ·175 = ·833, and the same for others except "suji," which is generally sown without ploughing, and whose depth therefore equal 5 × ·175 = ·875. For rice this method is inapplicable, and it is assumed to be 50 days under water, and its daily absorption 0·16 foot (the mean of 22 measurements), giving a total of 8·00 feet.

	c.	h.	A.	D.	z,
First watering ...	·04	·27	4,000 square feet.	0·45 cubic feet per second.	·286
Second ,, ...	·02	·24			·247
Third, fourth, fifth, &c. ...	·02	·17			·175

Name of Crop.	Number of waterings.	Total depth of waterings.
Wheat, barley, poppy, &c. ...	4	·883
"Suji"	5	·875
Gram, "wanh," &c. ...	1	·286
Sugar-cane	11	2·108
Indian corn	4	·883
Cotton	4	·883
"Charhi"	2	·533
Rice	...	8·00

21. *Summary.*—As regards the loss in canal and rajbahas there seems no remedy, though the cause of that in the upper reach of canal seems to deserve some investigation. For the watercourses the obvious remedy is to increase the size, thus carrying the water nearer its destination before finally again subdividing. Each village

should have its own minor rajbaha dividing into branches for the different sections or "pattis" of village, and each branch used alternately and capable of taking the full supply, say 3 or 4 cubic feet per second. It would be often possible to use the same minor for two or more villages on different days, and in this there would be a gain, seeing that absorption in a channel always full is less than on one only occasionally so. From the minor watercourses would take out, each discharging about 0·4 or 0·5 cubic foot. It might be possible in some cases to puddle the channels with the top layer of old rice fields, and thus parhaps do good to both. To reduce waste, the first thing is to abolish the custom of filling from one "kiári" into another, as in most cases this requires more water than if there were no "kiáris" at all, seeing that each compartment after filling becomes a pond, whose level is gradually raised until it is enough to force the discharge, still left after absorption, through a narrow opening into the next "kiári." Next $70' \times 70'$ "kiáris" should be enforced especially in the first watering, where at present hardly any attempt is ever made at subdivision, the water (then plentiful) often running whole nights on to fields several acres in extent. Thus with the mean discharge at fields = 0·35 cubic foot say, it would take a depth of 0·44 foot to cover a field even of 20,000 square feet, when $c = 0{\cdot}04$ and $h = 0{\cdot}27$. Another cause of loss lies in more waterings being given than necessary, five or six for wheat being very common, four being sufficient. For this and carelessness generally, the only real remedy is in payment by quantity used, the required measurements being made at minor's head. The introduction of minors on old established rajbahas would not be easy, but when they are prepared for it, it might be possible to have a modified system of measurement, though there are several difficulties in the way. Thus the whole rajbaha might be made into a sort of module only open on certain days, discharging a fixed amount, and supplying all the mogas at once, each of the latter being turned into a syphon with a fixed fall or head of water through it, the time being recorded at head of rajbaha by a self-registering gauge. This would not do away with loss in watercourses, but would abolish another source of trouble and loss, *viz.*, "bandi," during which the loss due to leakage of closed mogas is often very great. Thus as an extreme case in a rajbaha on which "bandi" was in force 14 miles, the loss in that distance was found to be 17 per cent. of the quantity entering, not including that due to absorption.

22. *Theory of flow over a field.*—The equations used previously are thus deduced, using the same notation as in paras. 14, 15, 16, and 17. For diagram, see *Fig.* 3. At any point xy the discharge passing forward is $(D - bcx)$, bcx being the amount lost by absorption between O and X. But the discharge = byv, where v = mean velocity at x, and since $v = m\sqrt{rs}$, we have $D - bcx = bym\sqrt{rs}$,

$$\text{or } D - bcx = -bym\sqrt{y\frac{dy}{dx}}, \text{ since } r = y \text{ sensibly, and } s = -\frac{dy}{dx}, \ldots\ldots(1).$$

therefore

$$y^3\frac{dy}{dx} = -\frac{(D-bcx)^2}{m^2b^2} \ldots\ldots\ldots\text{squaring.}$$

$$\therefore \int y^3 dy = -\int \frac{(D-bcx)^2}{m^2b^2}.$$

$$\text{or } \frac{y^4}{4} = \frac{(D-bcx)^3}{3m^2b^3c} + \text{constant}\ldots\ldots\ldots\text{integrating,}$$

but when $x = l$, $y = 0$, $\therefore$ constant $= -\frac{(D-bcl)^3}{3m^2b^3c}$.

$$\therefore \frac{y^4}{4} = \frac{(D-bcx)^3 - (D-bcl)^3}{3m^2b^3c} \text{ is the equation of surface of water,}\ldots(2).$$

Had there been no absorption, instead of equation (1) we would have

$$D = -bym\sqrt{y\frac{dy}{dx}}.$$

$$\text{or } y^3\frac{dy}{dx} = -\frac{D^2}{b^2m^2}, \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(3).$$

$$\therefore \int y^3 dy = -\int \frac{D^2}{m^2b^2}dx.$$

$$\therefore \frac{y^4}{4} = -\frac{D^2x}{m^2b^2} + \text{constant,}\ldots\ldots\text{integrating,}$$

but when $x = l$, $y = 0$, $\therefore$ constant $= \frac{D^2 l}{m^2 b^2}$.

$$\therefore \frac{y^4}{4} = \frac{D^2 (l - x)}{m^2 b^2} \ldots \text{is the equation of water surface when } c = 0, \ldots\ldots (4).$$

When bcx is small compared to D, equation (4) differs very slightly from equation (2), and as this is the case whenever the results are of any importance, equation (4) is adopted for further investigation. Since d = mean value of y, the area between curve and OX $= d \,.\, l$, and thus

$$d \,.\, l = \int_0^l y dx = \left(\frac{4D^2}{m^2 b^2}\right)^{\frac{1}{4}} \int_0^l (l - x)^{\frac{1}{4}} dx.$$

$$\text{or } d \,.\, l = \frac{4}{5} \sqrt{\frac{2D}{mb}}\, l^{\frac{5}{4}} = \text{area between curve and OX} \ldots \text{integrating},$$

$$\therefore d = \frac{4}{5} \sqrt{\frac{2D}{mb}}\, l^{\frac{1}{4}} = \text{mean value of } y, \ldots\ldots\ldots\ldots (5).$$

When $x = 0$, $y = \sqrt{\frac{2D}{mb}}\, l^{\frac{1}{4}}$ from equation (4) = value of y or heading up at 0,..(6).

As d increases so slowly with l, we can assume as approximate that we have a constant depth of water $= e + d = h$ being spread over an area $= bl = A$ say at any time $= t$ say, and being absorbed at rate of c feet deep per hour. Then during any instant of time dt the quantity entering field is $D \,.\, dt$; the quantity lost is $A \,.\, c \,.\, dt$, and the quantity flowing forward past the area A is $h \,.\, dA$, A being one of the variables—

$$\therefore D dt - A c dt = h \,.\, dA \text{ or } \frac{dt}{dA} = \frac{h}{D - Ac}, \ldots\ldots\ldots\ldots (7).$$

$$\therefore t = \int \frac{h}{D - Ac} dA = -\frac{h}{c} \log_e (D - Ac) + \text{constant},$$

but when $t = 0$, $A = 0$, $\therefore$ constant $= \frac{h}{c} \log_e D$.

$$\therefore t = \frac{h}{c} [\log_e D - \log_e (D - Ac)] = \frac{h}{c} \log_e \frac{D}{D - Ac} \text{ using hyperbolic logs},$$

$$\text{or } t = \frac{2{\cdot}3\, h}{c} \log \frac{D}{D - Ac} \text{ approximately using common logs}, \ldots\ldots\ldots (8).$$

But the total quantity entering in time t just found is Dt, and if z = mean depth, we have

$$Az = Dt = \frac{2{\cdot}3\, hD}{c} \log \frac{D}{D - Ac}.$$

$$\therefore z = \frac{2{\cdot}3\, hD}{Ac} \log \frac{D}{D - Ac} \text{ the mean depth required to cover A}, \ldots (9).$$

For h write $(e + d) = e + \frac{4}{5} \sqrt{\frac{2D}{mb}}\, l^{\frac{1}{4}}$, and for A write bl, and we have

$$z = \frac{2{\cdot}3\, D \left(e + \frac{4}{5} \sqrt{\frac{2D}{mb}}\, l^{\frac{1}{4}}\right)}{bcl} \log \frac{D}{D - bcl}$$

Then differentiating, with regard to D, and again substituting d after differentiation, for shortness we get $\frac{dz}{dD} = 2{\cdot}3 \log \frac{D}{D - bcl} (e + \frac{3}{2} d) - \frac{bcl}{D - bcl} (e + d)$, equating which to zero we have

$$2{\cdot}3 \log \frac{D}{D - bcl} (e + \tfrac{3}{2} d) = \frac{bcl}{D - bcl} (e + d), \ldots\ldots\ldots\ldots (10).$$

as the equation from which to find that value of D which will cover the area b with the least expenditure of water.

R. G. K.

Note by A. B. PHELAN, ESQ., *Executive Engineer, on Mr. Kennedy's Paper.*

Para. 2.—The ground experimented on was outside Vahu Choki compound, and had been trenched at one time. The quantity of absorption would vary with the state of the ground surface. Thus the Forest officer reports that if his trenches are in good order less water is required for irrigating a fixed area.

Example.—Absorption would be greater on a deeply freshly ploughed field than on one lying fallow and trodden by cattle for years.

Para. 7.—The co-efficient of absorption will doubtless vary with the depth of supply in the canal, and would be comparatively greater in a deep than in a shallow channel. Hence *cæteris paribus*, the loss is greater above than below Aliwal. The deduction that only 1625 cubic feet reach the rajbaha heads, cannot, I think, be sustained.

Mr. Higham observed a loss of 46·18 cubic feet in 63 canal miles, while, it is supposed he endeavoured to force down a full supply. For this purpose he closed the rajbaha heads in the interval. Now under ordinary circumstances a certain portion of the supply of the 2nd Division is not subjected to loss by absorption at all, *viz.*, that passed into rajbahas above Aliwal. Another portion is passed off into rajbahas in the 13th mile, and so on. Thus the loss by absorption cannot be properly arrived at without the function of duration being admitted into the calculation. The discharge of each rajbaha should be taken separately, and the loss the canal has sustained in forcing the supply to its head. All these losses added up will give the total loss in the main canal. The same sort of calculation would be applicable to the losses in the distributaries, and in minor watercourses. The co-efficient of absorption is roughly 0·008 foot per hour, so the whole supply of say 5 feet in depth would be absorbed in 26 days. At that time the water would reach, at 2 feet per second, 853 miles.

Para. 10.—Mr. Kennedy has omitted to record that in those days not only was the rabi crop irrigated, but probably nearly the whole of the preceding kharif got one or two waterings. He surely should have added the sugar-cane crop, and it is well understood that rice, cotton, &c., is irrigated up to November. The real difficulty in obtaining a satisfactory result from flow as opposed to lift irrigation lies in the fact that in the former a man cuts the water into his field and goes home, on the latter he has to watch the bullocks, and watering on the spot thus economising the supply. Waste of water occurs frequently on flow irrigation owing to the absence of the cultivator, while on lift irrigation the waste occurs in long deep watercourses, before it reaches the machine.

A. B. P.

Review of Mr. Kennedy's Note, by T. HIGHAM, ESQ., *Offg. Superintending Engineer, Bari Doab Canal.*

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1. *Want of details of Experiments,*—Mr. Kennedy's very interesting and suggestive Note compresses so much into so small a compass, that it is difficult to review even his leading conclusions except at greater length than that of the Note itself. The first thing that strikes one is, however, that too much has been sacrificed for the sake of brevity, and that fuller information should have been given as to the number and conditions of the experiments, while all details should have been added as an Appendix. It is possible that Mr. Kennedy can still supply the record that is wanting, but as he has left the country on furlough, it is not at present available. Without this it is impossible to accept the various constants and co-efficients that are given in the Note, the real value of which appears to me to consist not in the conclusions which it has been sought to establish, but in the just appreciation it shows of the difficulties that surround the subject, and the really scientific method in which the question is discussed. Even if the full details of the experiments be found to leave no room for criticism, it may be doubted whether they have extended over a sufficient time and area, to be regarded as final or conclusive, but it may nevertheless be claimed for the Note that it has laid down the lines on which further and future enquiries should be conducted, and that it suggests what a wide field yet remains for scientific investigation in connection with the economy of canal distribution.

2. *Mr. Kennedy's general conclusion.*—The first point to be noticed is the startling conclusion summarized in para. 11 of the Note, in which is presented that out of 100 cubic feet entering the Bari Doab Canal in the rabi 1881-82, 20 were lost by absorption in the main line and branches,

6 by absorption in the rajbahas, 21 by absorption in the watercourses, and 25 by wasteful application of the water, the loss from all the above causes aggregating 72, so that 28 per cent. only of the supply was really required for maturing the crop.

3. *Loss by absorption on Main Line and Branches.*—The Executive Engineer, 2nd Division, in forwarding Mr. Kennedy's Note, has added a few remarks, which are appended, in which he questions the correctness of Mr. Kennedy's conclusions in regard to the absorption on the main line and branches, and contends that the loss on each reach, that is, above every series of rajbaha heads, should be considered separately. This is true if absorption is calculated, as is often the custom, as a percentage of the supply, which is an obviously inaccurate method. Mr. Kennedy has, however, calculated it simply as varying with water surface, and his estimate of the total daily loss in the canal channels is incorrect only for the days in which any portion of the channels are dry, while the excess due to this cause will, in a measure, be neutralized by the higher rate of absorption that will prevail over such portions when they are re-opened. It is probable indeed as pointed out by Executive Engineer that the rate of absorption, or value of *c*, (that is the depth of water disappearing per hour,) is a function of the depth, and this may afford a partial explanation of the fact that the value of *c* is four times as great over the main line and main branch upper as in the lower branches. Mr. Kennedy has, however, assumed the higher value of *c* for this length, which includes the effect due to the increased depth, and we may accept the method and conclusion adopted in para. 7, from which it appears that, *whatever the supply*, 411 cubic feet disappear per second in the main canal provided water reaches all the tails.

4. *Loss on Rajbahas.*—In the case of rajbahas the method employed is equally correct, but the data are less exact, and the error due to the fact that portions of the rajbaha channels are constantly dry will be greater. Mr. Kennedy has endeavoured to meet this by reducing the total length of rajbaha channel by $\frac{1}{11}$, but this is probably insufficient; there are, however, no data by which this point can be easily determined.

5. *Method of determining the volume absorbed from a given water surface.*—The method by which the value of *c* is obtained for rajbahas and watercourses is a more tangible point for objection, and it is here that the absence of details of experiments will be most felt. We may accept for the present the theory that the absolute loss in a given reach is the same with stagnant water as with a flowing current, but proof on the point is nevertheless desirable. It may be pointed out, however, that the effect of bunding up a reach of either a rajbaha or a watercourse is to increase the depth at the lower end, and the addition thus made to the perimeter will ordinarily be in dry and absorbent soil, so that the experiment would be vitiated unless the impounded water were allowed to stand for some hours at any rate (additions being made to balance the loss) before observations on the sinkage of the surface level were taken.

6. *Water required for maturing crops.*—The main interest of the Note, however, centres on the conclusion as to the water actually required for maturing the crops. If it be true that 28 per cent. only is required, it is obvious that 72 per cent. disappears from either inevitable or preventible causes, and however interesting it may be to determine the proportions of this due to loss in the main channels, rajbahas, watercourses and general wastefulness, it is of greater importance to ascertain first what the total loss really is, irrespective of the share attributable to each of the above causes. One obvious error is pointed out by the Executive Engineer, but is not as important as might be supposed. Mr. Kennedy, in his para. 10, has taken no account of the sugar-cane waterings that are given in the rabi, or of the waterings given to other kharif crops, more especially rice in October. Now that no charges are made for *vad* irrigation, the October watering of kharif crops become annually more considerable, and are not confined only to rice. The total area of sugar-cane was 12,700 acres,

and of rice 32,074 acres, and if we assume that a depth of 0·5 water was necessary for the former, and 1·0 foot was given to the latter after the 1st October, and deduct this quantity from the numerator of the fraction in para. 10 of the Notes, the resulting value of the fraction will be reduced from 2·95 to 2·79 feet, and the percentage of useful effect will be increased 27·6 to 29·2, so that we may afford to consider it in round numbers 30 per cent.

7. *Minimum depth of Waterings.*—It is probable, however, that the depth of the watering required to mature a crop has been under-estimated. It is assumed that a field is thoroughly irrigated directly the water arrives at the far side, and is shown that when the kiaris bear a proper proportion to the discharge of the duct, four waterings for wheat can thus be given with an aggregate depth of only ·883 (*see* para. 20), and a less depth appears to have actually sufficed for fields E and and F (*see* para. 13). In the latter, however, a preliminary accidental watering had been given, and the crop is said to have been inferior to that on A and B, where the depths were 1·081 and 0·924. A margin must also be allowed for differences of soil, and it is not clear that a more liberal watering might not have improved the yield. Still Mr. Kennedy's results may be regarded as showing the absolute minimum, a minimum that cannot be expected in practice, any more than laboratory experiments can be reproduced in the workshop, but may nevertheless be taken as the limit towards which actual practice should more and more tend.

8. *Loss due to percolation.*—Mr. Kennedy considers two classes of absorption, one of which may be called percolation, and the other, for the sake of distinction, secretion. By the former is meant the passage of water into the subsoil, which is supposed to be continually in progress, and to be almost independent of the surface, though not of the nature of soil. The experiment referred to in para. 2 is most interesting, and the Executive Engineer in his remarks on it appears to miss the point when he states that the quantity of absorption will depend on the ground surface. When the upper soil is thoroughly saturated, the nature of surface can make little difference to the percolation, and the object of the experiments is not to show the quantity lost by absorption, but the persistence of the percolating action. Excluding the first day as one in which the nature of the surface may have affected the result, we find that the loss on the second day amounted to 1·13 feet, although the plot had been thoroughly flooded throughout the whole of the preceding day. During the 8th day the loss was 0·77, so that the rate of percolation appears to decrease very slowly, even after prolonged saturation, and must be practically independent of the surface. It is the loss due to this cause only which is referred to as *c* in the Note, and it is stated to vary on different soils from 0·02 to 0·08 of a foot per hour, the rate being for all practical purposes constant and continuous at the same time.

9. *Loss by secretion.*—By secretion is meant the disappearance of water run over a dry surface, in filling holes and hollows beneath the clods. The depth of water secreted will depend almost entirely upon the state of the surface, and be irrespective of the time during which water is flowing. Mr. Kennedy estimates it at 0·21 foot per unit of area for a first watering on a new ploughed field, as varying from 0·18 to 0·12 for the second watering after levelling with the *swaga*, and at 0·11 to 0·05 for the third and subsequent waterings when the upper soil has caked.

10. *Total depth required for a watering.*—The total depth of water required for a watering will therefore be the mean head necessary to force it across the field, which varies but slightly with the length, and may be assumed at an average of 0·06 for ordinary ducts *plus* the depth of secretion, (which is 0·21 for a first watering,) *plus* the depth of percolation which will depend upon the time taken to flood the field, and upon the nature of the soil. The time will again depend on the discharge of the watercourse and on the area of the field. The total depth required for a first watering for different areas, discharge, and classes of soil, as determined by their precolating co-efficients, can be readily ascertained from Mr. Kennedy's ingenious diagram.

11. *Theory of Kiaris.*—This brings us to the theory of kiaris. The mean head and depth of water secreted have been shown to together equal 0·27, and this is the minimum depth for a first watering, no matter what the quality of the soil, as the percolation is supposed *nil*. This will only happen when the time occupied in filling the fields is infinitesimal, and the object of kiaris is to reduce this time to the lowest possible limit. Thus in the case of a 36′ × 36′ kiari, it is shown that the depth required would be 0·272, when $c = \cdot 04$, or only ·002 is lost by percolation. With a 70′ × 70′ kiari the depth is estimated at 0·291, so that ·021 disappears by percolation. Mr. Kennedy appears to consider all percolation as loss, that is, that it is unnecessary, but even so he recognises that a loss of ·021 foot in a watering of the larger kiari as compared with ·002 in the smaller, or a net loss of ·019, is so inconsiderable, that it is needless to insist on the small size. It is doubtful however whether such a moderate amount af percolation is really lost. There can any how be no question that 70′ × 70′ is not a very wasteful size, or much too large, while 36′ × 36′ presses heavily on the cultivators. It is obvious too that if we double the supply we may double the area of the kiari without increasing the loss due to percolation, so that, as so often stated, the proper size for kiaris depends entirely on the discharge of the ducts, and a field irrigated from a large watercourse does not require to be parcelled out in the same way as one fed from a well, with perhaps only a quarter of the discharge.

12. *Further remarks on Kiaris.*—Kiaris have however, a second use that does not appear to be considered in the Note in facilitating the distribution of the water over uneven ground. The system is no doubt most useful, but it is difficult to lay down any arbitrary rules on the subject. The enforcement of kiaris must be left to the discretion of the Canal officer, and undue stringency or laxity are alike to be deprecated.

13. *Remedial measures for minimizing the loss from all causes.*—On the general question of remedies, I doubt whether payment by quantity of water used, even if practicable, would tend to prevent wasteful irrigation, as the loss due to waste could be traced to individuals. I should prefer to rely on the effect of rigidly enforced *tatils*, which, whatever the objections to them, appear to be the surest means of securing economical distribution. When the users of a watercourse know that it will only be opened for a limited time, and that the supply will be short and sharp, each man will be forced to put the water over his ground as quickly as possible, which is only another way of saying that he will waste as little as possible. It is, however, on the watercourses that there appears to be most room for improvement, which would be effected by reducing their number by amalgamation, in accordance with the system now being introduced on the Sirhind Canal. But in new rajbahas at any rate we might go a step further, and introduce the stop-dam system on the rajbahas. I append an extract from a note by Mr. Phelan, received in connection with another case, which fully explains what is meant.

If carried out in its entirety, nearly half the present irrigation might be effected with water running in the upper third only of the rajbahas, and it is easy to see that the average length of rajbaha daily open would not be more than two-thirds of the total mileage, so that the loss on rajbahas would be reduced from 6 to 4 per cent., while on watercourses and fields the saving would be equally considerable.

14. *Loss on the Main Channels is inevitable.*—No suggestions can be made for reducing the loss by percolation in the main channels. It is of course generally desirable to carry water to the lower end of a canal where it is more valuable and more required, but the loss that this involves should not be lost sight of, and due weight should be given to it in all schemes for extensions. It would be interesting to ascertain whether the great loss on the main line depends in any way on the depth, upon which depends the question, whether deep and narrow channels will lose less by percolation than wide and shallow ones, having the same discharge. This might be effected by repeating the 1875 experiments on absorption during a period of half supply when the depth would be greatly decreased, but the surface width be practically the same.

15. *General Conclusions.*—The general conclusion that may be drawn, though with some reserve, is that out of 100 feet entering the canal 20 is unavoidably lost in the main channel, and 30 is a possible minimum that will suffice for irrigation; 50 feet are lost in the rajbahas, watercourses and wasteful applications. It is perhaps not too much to hope that by improved arrangements this loss might be reduced by a third, or that $\frac{50}{3} = 16 \cdot 6$ feet might be made available for further irrigation. This would mean an increase in the irrigated area, and in the revenue of over 50 per cent., and however remote this limit may be, the possibilities of approaching it can hardly be questioned, and afford the greatest encouragement to further effort and enquiry.

16. In conclusion, I would observe that the subject is of sufficient importance to justify further investigation, and I would suggest that Mr. Kennedy might with great advantage be specially employed on his return from furlough in pursuing this enquiry on an extended scale for at least two crops. It is unnecessary at present to draw up a scheme for such enquiry, but it would probably be of great advantage to accurately ascertain the whole duty of selected rajbahas and watercourses throughout the crop, in addition to noting the water required for individual fields. I would further suggest that independently of this enquiry, the Executive Engineer should be allowed to select certain rajbahas, and after first ascertaining their duty under present circumstances, that he should be allowed *carte blanche* in the matter of amalgamating the watercourses, erecting stop-dams and establishing *tatils*, and that special observation of the duty realized should be taken in every crop. If it were found gradually to increase there would be some encouragement to proceed in the same direction, until the maximum possible duty had been obtained from the water in all parts of the Canal.

T. H.

Extract from a Note by A. B Phelan, Esq., *Executive Engineer, 2nd Division.*

My object in this matter is to produce a strong general demand for canal water, and the only way to do so, is to bring the supply convenient to a far larger area than can ever be supplied.

The longer I keep my stock (in this case it is canal water), so much in direct proportion do I lose it by percolation and other wasting processes. It is, therefore, my aim to consolidate my supply, force it through all channels and obstacles at the highest velocity, and in fact get rid of it as soon as possible, keeping it, however, together as long as possible. Thus the slopes in the main canal and distributaries should be as rapid as the banks and bed will allow of without abrasion, and when I issue it to a village, I should do so by damming it up, forcing it freely through a capacious outlet into a large watercourse, and only dividing it at the last moment, when I hand it finally over to the community. Their time being over, I withdraw the planking from the regulator and turn it on elsewhere. Thus the irrigation will be effected rapidly and with least loss, for the more I subdivide it, the greater is the waste by various means, especially that of absorption, and standing water in numerous badly formed channels.

The total loss is supposed to be over 50, possibly 70 per cent., as Mr. Kennedy makes out that the duty of our irrigating machine (the Bari Doab Canal) is but 28, were another 28 per cent. saved the revenue of the canal would therefore be doubled, so it is a matter of greatest importance to find a more economical system.

A great source of waste is our long distributaries, and I will enclose here a sketch (*Plate* III) of what I consider to be the most economical form for distributaries to take. It is that of a kite. Now an officer who looks carefully after his distribution and supplies the outlets fairly from head to tail of his rajbahas, will find on plotting the result that the area will resemble the plan of a

fox's tail. Thus with the best intentions he is losing good revenue by forcing the supplies to unnecessary long distributaries.

My idea is to have big branches near the head, minor towards the middle, village watercourses below that, and petty private outlets in the lowest reaches.

A. B. P.

B.

Bombay Canal Legislation.

BOMBAY ACT No. VII OF 1879.

Preamble.

WHEREAS it is necessary to make provision for the construction, maintenance, and regulation of canals, for the supply of water therefrom, and for the levy of rates for water so supplied, in the Bombay Presidency; It is enacted as follows:—

PART I.

PRELIMINARY.

Short Title.

1. This Act may be called "The Bombay Irrigation Act, 1879."

Local extent.

It extends to the whole of the Presidency of Bombay, except the City of Bombay.

Sections 55, 101 and 105 of the Bombay Land Revenue Code, 1879, amended.

2. In Section 55 of the Bombay Land Revenue Code, 1879, for the words "or which has been made available in consequence of the construction, improvement or repair of any irrigational or other work by, or at the instance of Government," the words "and in respect of which no rate is leviable under the Bombay Irrigation Act, 1879," shall be substituted;

and Section 101 of the said Code for the word "leviable," the word "levied" shall be substituted, and the words "or under the Bombay Irrigation Act, 1879," shall be inserted after the figures "55";

and to Section 105 of the said Code the words "or of the Bombay Irrigation Act, 1879," shall be added.

Interpretation section.

3. In this Act, unless there be something repugnant in the subject or context,

(1)—"canal" includes—

"Canal."

(a) all canals, channels, pipes, and reservoirs constructed, maintained, or controlled by Government for the supply or storage of water;

(b) all works, embankments, structures, and supply and escape channels connected with such canals, channels, pipes, or reservoirs, and all roads constructed for the purpose of facilitating the construction or maintenance of such canals, channels, pipes or reservoirs;

(c) all watercourses, drainage-works, and flood embankments as hereinafter respectively defined;

(d) any part of a river, stream, lake, natural collection of water, or natural drainage-channel, to which the Governor in Council may apply the provisions of section five, or of which the water has been applied or used before the passing of this Act for the purpose of any existing canal;

(e) all land belonging to Government which is situate on a bank of any canal as hereinbefore defined, and which has been appropriated, under the orders of Government, for the purposes of such canal;

"Water-course."

(2)—"water-course" means any channel or pipe not maintained at the cost of Government, which is supplied with water from a canal, and includes all subsidiary works connected with any such channel or pipe, except the sluice or outlet through which water is supplied from a canal to such channel or pipe;

"Drainage-work."

(3)—"drainage-work" means any work in connection with a system of irrigation or reclamation made or improved by the Government for the purpose of the drainage of the country, whether under the provisions of section fifteen or otherwise, and includes escape channels from a canal, dams, weirs, embankments, sluices, groins, and other works connected therewith, but does not include works for the removal of sewage from towns;

"Flood-embankment."

(4)—"flood-embankment" means any embankment constructed or maintained by Government in connection with any system of irrigation or reclamation works for the protection of lands from inundation, or which may be declared by the Governor in Council to be maintained in connection with any such system, and includes all groins, spurs, dams, and other protective works connected with such embankments;

"Collector."

(5)—"Collector" means the head revenue officer of a district, and includes any officer appointed by the Governor in Council to exercise all or any of the powers of a Collector under this Act;

"Canal Officer."

(6)—"canal officer" means any officer lawfully appointed or invested with powers under section four;

"Owner."

(7)—"owner" includes every person having a joint interest in the ownership of the thing specified; and all rights and obligations which attach to an owner under the provisions of this Act shall attach jointly and severally to every person having such joint interest in the ownership.

Appointment of Canal Officers.

4. Government or, subject to such orders as may from time to time be passed by Government, any officer of Government whom the Governor in Council empowers in this behalf, may

(a) appoint such officers with such designations, and assign to them respectively such powers and duties under this Act as Government or such officer may deem fit,

(b) invest any Government officer in any department, either personally, or in right of his office, or any other person, with such powers, and impose upon him such duties, under this Act, as Government or such officer may deem fit:

Proviso.

Provided that any assignment of, or investment with, powers or duties made under this section may at any time be cancelled or varied by the authority who made it.

PART II.

OF THE CONSTRUCTION AND MAINTENANCE OF CANALS.

Application of Water for purposes of Canals.

Notification to issue when water-supply is to be applied for purposes of any Canal.

5. Whenever it appears expedient to the Governor in Council that the water of any river or stream flowing in a natural channel, or of any lake, or any other natural collection of still water should be applied or used by the Government for the purposes of any existing or projected canal;

the Governor in Council may, by notification in the *Bombay Government Gazette*, declare that the said water will be so applied or used after a day to be named in the said notification, not being earlier than three months from the date thereof.

Powers of Entry on Land, &c.

Powers of canal officers for the purpose of so applying a water-supply.

6. At any time after the day so named any canal officer duly empowered in this behalf may enter cn any land, remove any obstruction, close any channel, and do any other thing necessary for such application or use of the said water, and for such purpose may take with him, or depute, or employ, such subordinates and other persons as he deems fit.

Entry for inquiry.

7. Whenever it shall be necessary to make any enquiry or examination in connection with a projected canal, or with the maintenance of an existing canal, any canal officer duly empowered in this behalf and any person acting under the general or special order of any such canal officer, may

(a) enter upon such land as he may think necessary for the purpose, and

(b) exercise all powers and do all things in respect of such land as he might exercise and do if the Government had issued a notification under the provisions of section four of the Land Acquisition Act, 1870, to the effect that land in that locality is likely to be needed for a public purpose, and

(c) set up and maintain water-gauges and do all other things necessary for the prosecution of such enquiry and examination.

Power to inspect and regulate water-supply.

8. Any canal officer duly empowered in this behalf and any person acting under the general or special order of any such canal officer, may enter upon any land, building or water-course, on account of which any water-rate is chargeable, for the purpose of inspecting or regulating the use of the water supplied, or of measuring the land irrigated thereby or chargeable with a water-rate, and of doing all things necessary for the proper regulation and management of the canal from which such water is supplied.

Power to enter for repairs, and to prevent accidents.

9. In case of any accident being apprehended or happening to a canal, any canal officer duly empowered in this behalf and any person acting under the general or special order of any such canal officer, may enter upon any land adjacent to such canal and may take trees and other materials, and execute all works which may be necessary for the purpose of preventing such accident, or repairing any damage done.

Notice to occupier of building, &c.

10. When a canal officer or other person proposes, under the provisions of any of the three last preceding sections, to enter into any building or enclosed court or garden attached to a dwelling house, not supplied with water from a canal, and not adjacent to a flood-embankment, he shall previously give to the occupier of such building, court, or garden such reasonable notice as the urgency of the case may allow.

Canal Crossings.

Means of crossing canals and of drainage to be provided as may be deemed necessary by Government.

11. Suitable means of crossing canals shall be provided at such places as the Governor in Council thinks necessary for the reasonable convenience of the inhabitants of the adjacent land; and suitable bridges, culverts, or other works shall be constructed to prevent the drainage of the adjacent land being obstructed by any canal.

Removal of Obstructions to Drainage.

Governor in Council may prohibit formation of obstructions of rivers, &c., within certain limits.

12. Whenever it appears to the Governor in Council that injury to the public health, or public convenience, or to any canal, or to any land for which irrigation from a canal is available, has arisen or may arise from the obstruction of any river, stream, or natural drainage-course, the Governor in Council may, by notification published in the *Bombay Government Gazette*, prohibit, within limits to be defined in such notification, the formation of any such obstruction, or may, within such limits, order the removal or other modification of such obstruction.

Thereupon so much of the said river, stream, or natural drainage-channel as is comprised within such limits, shall be held to be a drainage-work as defined in section three.

Canal Officer may issue order to person causing obstruction.

13. Any canal officer duly empowered in this behalf may, after such publication, issue an order to any person causing or having control over any such obstruction to remove or modify the same within a time to be fixed in such order.

Canal officer may cause obstruction to be removed.

14. If, within the time so fixed, such person does not comply with the order, the canal officer may cause the obstruction to be removed or modified; and if the person to whom the order was issued does not, when called upon, pay the expenses of such removal or modification, such expenses shall be recoverable by the Collector as an arrear of land-revenue.

Construction of Drainage Works.

When drainage-works are necessary Governor in Council may order a scheme to be drawn up and carried out.

15. Whenever it appears to the Governor in Council that any drainage work is necessary for the public health or for the improvement of the proper cultivation or irrigation of any land, or that protection from floods or other accumulations of water, or from erosion by a river, is required for any land, the Governor in Council may cause a scheme for such work to be drawn up and carried into execution,

and the person authorized by the Governor in Council to draw up and execute such scheme may exercise in connection therewith the powers conferred on canal officers by sections seven, eight, and nine, and shall be liable to the obligations imposed upon canal officers by sections ten and thirty-four.

PART III.

Of Water Courses.

Construction of New Water Courses.

Construction of new water-courses by private arrangement.

16. Any person may, with the permission of a canal officer duly empowered to grant such permission, construct a new water-course if he has obtained the consent of the holder of the land required therefor.

Application may be made for construction by a canal officer of a new water-course.

17. Any person desiring to construct a new water-course, but being unable or unwilling to construct it under a private arrangement with the holder of the land required for the same, may apply, in writing, to any canal officer duly empowered to receive such applications, stating

(1)—that he is ready to defray all the expenses necessary for acquiring the land and constructing such water-course;

(2)—that he desires the said canal officer in his behalf and at his cost to do all things necessary for constructing such water-course.

18. If the canal officer considers the construction of such water-course expedient, he may call upon the applicant to deposit any part of the expense such officer may consider necessary,

Procedure when canal officer considers construction of such water-course expedient.

and upon such deposit being made, shall cause enquiry to be made into the most suitable alignment for the said water-course,

and shall mark out the land which, in his opinion, it will be necessary to occupy for the construction thereof,

and shall forthwith publish a notification in every village through which the water-course is proposed to be taken, that so much of such land as is situated within such village has been so marked out,

and shall send a copy of such notification to the Collector of every district in which such land is situtated for publication on such land.

The said notification shall also call upon any person who wishes to share in the ownership of such water-course to make his application in that respect to the canal officer within thirty days of the publication of such notification.

Person wishing to be joint owner must make his application within thirty days.

If any such applicant appears, and his application is admitted, he shall be liable to pay his share in the construction of such water-course, and in the cost of acquiring the land for the same, and shall be an owner of such water-course when constructed.

If his application is admitted, he will be liable for a share of the cost.

19. On receipt of copy of such notification, the Collector shall proceed to acquire such land under the provisions of the Land Acquisition Act, 1870, as if a declaration had been issued by the Government for the acquisition thereof under section six of that Act, and as if the Government had thereupon directed the Collector to take order for the acquisition of such land under section seven of the said Act, and (if necessary) as if the Government had issued orders for summary possession being taken under section seventeen of the said Act.

Collector to acquire land.

20. On being put in possession of the land, the canal officer shall construct the required water-course; and on its completion shall give to the owner notice thereof, and of any sum payable by him on account of the cost of acquiring the land and constructing the water-course. On such notice being given, such sum shall be due from the owner to the canal officer. On receipt of payment in full of all expenses incurred, the canal officer shall make over possession of such water-course to such owner.

Procedure after construction of water-course.

Rights and Obligations of Owners of Water-courses.

21. Every owner of a water-course shall be bound—

Obligations of owner of water-course.

(a) to construct and maintain all works necessary for the passage across such water-course, of canals, water-courses, drainage channels, and public roads existing at the time of its construction, and of the drainage intercepted by it, and for affording proper communications across it for the convenience of the occupants of neighbouring lands;

(b) to maintain such water-course in a fit state of repair for the conveyance of water;

(c) to allow the use of it to others or to admit other persons as joint owners thereof on such terms as may be prescribed under the provisions of section twenty-three;

and every owner of a water-course and every person duly authorized under the provisions hereinafter contained to use a water-course shall be entitled—

Rights of owners and users of water-courses.

(d) to have a supply of water by such water-course at such rates and on such terms as may from time to time be prescribed under section forty-four and by the rules made by the Governor in Council under section seventy.

Provided always that any owner of a water-course and subject to the terms of any agreement of the parties, or to any condition imposed under section twenty-three, any such person as aforesaid may at any time by giving three months' previous notice in writing in this behalf to a canal officer duly empowered to receive such notices, resign his interest in such water-course.

22. Any person desiring to have a supply of water through a water-course, of which he is not an owner, may make a private arrangement with the owner for permitting the conveyance of water thereby, or may apply to a canal officer duly empowered to receive such applications for authority to use such water-course, or to be declared a joint owner thereof.

Person other than owner may arrange with owner to have supply of water through water-course, or may apply to canal officer to authorize supply or declare him a joint owner

23. On receipt of any such application, the canal officer shall serve notice on the owner to show cause why such authority should not be granted, or such declaration should not be made, and, if no objection be raised, or if any objection be raised and be found insufficient or invalid, shall, subject to the approval of the Collector, either authorize the applicant to use the water-course, or declare him to be a joint owner thereof on such conditions as to the payment of compensation or rent or otherwise as may appear to him equitable.

Canal officer after enquiry may authorize supply, or declare applicant to be a joint owner.

24. No land acquired under this Part for a water-course shall be used for any other purpose without the previous consent of a canal officer duly empowered to grant such permission.

Land acquired for a water-course may not be used for other purpose.

25. If any owner of a water-course fails to fulfil any obligation imposed upon him by clause (a) or (b) of section twenty-one, any canal officer duly empowered in this behalf may require him by notice to execute the necessary work or repair within a period to be prescribed in such notice, of not less than fifteen days, and, in the event of failure, may execute the same on his behalf; and, except as hereinafter provided in this section, all expenses incurred in the execution of such work or repair shall be a sum due by such owner to Government.

If owner fails to execute work, or to repair his water-course, canal officer may execute the same on his behalf.

Every person other than an owner who uses any water-course in respect of which any repair has been executed by a canal officer under this section shall, in the absence of any agreement between the parties or of any condition imposed under section twenty-three at the time such person was authorized to use such water-course to the contrary, be liable to pay to Government such proportion of the expenses incurred in the execution of such repairs as shall be determined by the said canal officer.

Person who uses the water-course to pay a share of the expenses of repair.

Settlement of Disputes concerning Watercourses.

26. Whenever a dispute arises between two or more persons in regard to their mutual rights or liabilities in respect of the use, construction, or maintenance of a water-course, or among joint owners of a water-course as to their respective shares of the expense of constructing or maintaining such water-course, or as to the amounts severally

Settlement of disputes as to mutual rights and liabilities of persons interested in a water-course.

contributed by them towards such expense, or as to failure on the part of any owner to contribute his share,

any person interested in the matter of such dispute may apply, in writing, to any canal officer duly empowered to receive such applications, stating the matter in dispute.

Such officer shall thereupon give notice to the other persons interested that, on a day to be named in such notice, he will proceed to enquire into the said matter,

and if all the persons interested consent, in writing, to his being arbitrator, he may pass his order thereon ;

failing such consent, he shall transfer the matter to the Collector, who shall enquire into and pass his order thereon.

Any order passed by the Collector under this section shall remain in force until set aside by a decree of a civil court.

PART IV.

Of the Supply of Water.

Applications for Supply.

Water to be supplied on written application ;

27. Every person desiring to have a supply of water from a canal shall submit a written application to that effect to a canal officer duly empowered to receive such applications in such form as shall from time to time be prescribed by Government in this behalf.

and water may be supplied for purposes other than those of irrigation.

If the application be for a supply of water to be used for purposes other than those of irrigation, the canal officer may, with the sanction of Government, give permission for water to be taken for such purposes under such special conditions and restrictions as to the limitation, control, and measurement of the supply as he shall be empowered by Government to impose in each case.

Provisions as to supply.

Power to stop water-supply.

28. The supply of water to any water-course or to any person who is entitled to such supply shall not be stopped except—

(*a*) whenever and so long as it is necessary to stop such supply for the purpose of executing any work ordered by competent authority ;

(*b*) whenever and so long as any watercourse by which such supply is received, is not maintained in such repair as to prevent the wasteful escape of water therefrom ;

(*c*) whenever and so long as it is necessary to do so in order to supply in rotation the legitimate demands of other persons entitled to water ;

(*d*) whenever and so long as it may be necessary to do so in order to prevent the wastage or misuse of water ;

(*e*) within periods fixed from time to time by a canal officer duly empowered in this behalf, of which due notice shall be given.

Duration of supply.

29. When canal water is supplied for the irrigation of one or more crops only, the permission to use such water shall be held to continue only until such crop or crops shall come to maturity, and to apply only to such crop or crops.

Agreements for supply of water transferable with the property in respect of which supply is given ;

30. Every agreement for the supply of canal-water to any land, building, or other immoveable property shall be transferable therewith, and shall be presumed to have been so transferred whenever a transfer of such land, building, or other immoveable property takes place.

but right to use of water may not be transferred in any other case without permission of canal officer.

No person entitled to the use of any work or land appertaining to any canal, and except in the case of any such agreement as aforesaid, no person entitled to use the water of any canal, shall sell, or sublet ; or otherwise transfer his right to such use without the permission of a canal officer duly empowered to grant such permission.

PART V.

Of the Award of Compensation.

Compensation when claimable.

Compensation to be paid in all cases of ascertainable substantial damage.

31. Compensation may be awarded in respect of any substantial damage caused by the exercise of any of the powers conferred by this Act, which is capable of being ascertained and estimated at the time of awarding such compensation :

Exceptions.

Provided that no compensation shall be so awarded in respect of any damage arising from

(*a*) deterioration of climate, or

(*b*) stoppage of navigation, or the means of rafting timber, or of watering cattle, or

(*c*) stoppage of diminution of any supply of water in consequence of the exercise of the power conferred by section five, if no use have been made of such supply within the five years next before the date of the issue of the notification under section thirty-seven, or

(*d*) failure or stoppage of the water in a canal, when such failure or stoppage is due to—

(1) any cause beyond the control of Government,

(2) the execution of any repairs, alterations or additions to the canal, or

(3) any measures considered necessary by any canal officer duly empowed in this behalf for regulating the proper flow of water in the canal, or for maintaining the established course of irrigation ;

Remission of water-rates when allowable.

but any person who suffers loss from any stoppage or diminution of his water supply due to any of the causes named in clause (*d*) of this section shall be entitled to such remission of the water-rate payable by him as may be authorized by the Governor in Council.

Limitation of claims.

32. No claim for compensation under this Act shall be entertained after the expiration of twelve months from the time when the damage complained of commenced unless the Collector is satisfied that the claimant had sufficient cause for not making the claim within such period.

Compensation not claimable in respect of works executed before this Act came into force.

33. No compensation shall be claimable under this Act in respect of any work executed before it came into force, or of any damage caused by or in the execution of any such work.

Summary Decisions.

34. In every case of entry upon any land or building under section six, section seven, section eight, or section nine, the canal officer or person making the entry shall ascertain and record the extent of the damage, if any, caused by the entry, or in the execution of any work, to any crop, tree, building or other property;

Compensation for damage caused by entry on land, &c.

and within one month from the date of such entry compensation shall be tendered by a canal officer duly empowered in this behalf to the land-holder, or owner of the property damaged.

If such tender is not accepted, the canal officer shall forthwith refer the matter to the Collector for the purpose of making enquiry as to the amount of compensation and deciding the same.

35. If the supply of water to any land irrigated from a canal be interrupted otherwise than in the manner described in clause (*d*) of section thirty-one, the holder of such land may present a petition for compensation to the Collector for any loss arising from such interruption, and the Collector, after consulting the canal officer, shall award to the petitioner reasonable compensation for such loss.

Compensation on account of interruption of water-supply.

36. The decision of the Collector under either of the last two preceding sections as to the amount of compensation to be awarded, or, if in any rule framed under section seventy such decision shall be declared to be appealable, then the decision of the authority to whom the appeal lies shall be conclusive.

Decision as to amount of compensation under either of the last two sections to be conclusive.

Formal Adjudications.

37. As soon as practicable after the issue of a notification under section five, the Collector shall cause public notice to be given at convenient places, stating that the Government intend to apply or use the water as aforesaid, and that claims for compensation may be made before him.

Notice as to claims for compensation in certain cases.

A copy of sections thirty-one and thirty-two shall be annexed to every such notice.

38. All claims for compensation under this Act, other than claims of the nature provided for in sections thirty-four and thirty-five, must be made before the Collector of the district in which such claim arises.

Claims to be preferred to the Collector.

39. The Collector shall enquire into every such claim and determine the amount of compensation, if any, which should in his opinion be given to the claimant, and sections eleven, twelve, fourteen, fifteen, eighteen to twenty-three (inclusive), twenty-six to forty (inclusive) fifty-one and fifty-eight of the Land Acquisition Act, 1870, shall apply to such enquiries:

Collector to be guided by the provisions of the Land Acquisition Act, 1870.

Provided that instead of the last clause of the said section twenty-six the following shall be read: "The provisions of this section and of sections thirty-one and forty of the Bombay Irrigation Act, 1879, shall be read to every assessor in a language which he understands before he gives his opinion as to the amount of compensation to be awarded."

40. In determining the amount of compensation under the last preceding section, regard shall be had to the diminution in the market-value, at the time of awarding compensation, of the property in respect of which compensation is claimed;

Diminution in market-value to be considered in fixing the amount of compensation.

and where such market-value is not ascertainable, the amount shall be reckoned at twelve times the amount of the diminution of the annual net profits of such property, caused by the exercise of the powers conferred by this Act.

41. All sums of money payable for compensation awarded under section thirty-nine, shall become due three months after the claim for such compensation was made;

Compensation when due.

and simple interest at the rate of six per centum per annum shall be allowed on any such sum remaining unpaid after the said three months, except when the non-payment of such sum is caused by the neglect or refusal of the claimant to apply for or receive the same.

Interest.

Abatements of Land Revenue and Rent.

42. If compensation is awarded under section thirty-nine on account of a stoppage or diminution of supply of water to any land paying revenue to Government, and the amount of the revenue payable on account of such land has been fixed with reference to the water-advantages appertaining thereto, the holder of the said land shall be entitled to an abatement of the amount of revenue payable to such extent as shall be determined by the Collector.

Abatement of revenue demand on interruption of water-supply.

43. Every inferior holder of any land in respect of which such compensation has been paid shall, if he receives no part of the said compensation, be entitled to an abatement of the rent previously payable by him to the superior holder thereof in proportion to the reduced value of the holding;

Abatement of inferior holder's rent on interruption of water-supply.

but if a water-supply which increases the value of the holding is afterwards restored to the said land otherwise than at the cost of the inferior holder, the superior holder shall be entitled to enhance the rent in proportion to such increased value; provided that the enhanced rent shall not in any case exceed the rent payable by the inferior holder before the abatement, unless the superior holder shall, independently of the provisions of this section, be entitled so to enhance the previous rent.

Enhancement of inferior holder's rent on restoration of water-supply.

PART VI.

Of Water Rates.

Supply Rates.

44. Such rates shall be leviable for canal-water supplied for purposes of irrigation or for any other purpose, as shall from time to time be determined by the Governor in Council.

Rates for supply of canal-water to be determined by Government.

If, owing to the construction of a new canal or to the improvement or extension of an existing canal, the amount or duration of any water-supply, in respect of which either no revenue, or a fixed amount of revenue has hitherto been paid to Government is increased, rates shall be leviable under this section in respect of the increased water-supply only.

Provision for cases in which existing water supply is improved.

The said rates shall be payable by the person on whose application the supply was granted, or by any person who uses the water so supplied.

Occasional Rates.

45. If water supplied through a water-course be used in an unauthorized manner, and if the person by whose act or neglect such use has occurred cannot be indentified, the person or all the persons on whose land such water has flowed, if such land has derived benefit therefrom,

Liability when person using water unauthorizedly cannot be identified.

or if no land has derived benefit therefrom, the person or all the persons chargeable in respect of the water supplied through such water-course.

The said list shall be published in such manner as the Collector deems fit in every village concerned, together with an intimation that all objections to any entry therein must be made to the Collector, in writing, within one month from the publication thereof.

Hearing of objections.

55. All objections duly made within the said period shall be heard and determined by the Collector, or, if the Collector shall so direct, by the Assistant or Deputy Collector in charge of taluka concerned, and the decision of the Collector or of the Assistant or Deputy Collector, as the case may be, shall be final.

Copy of list to be furnished to officer empowered to collect the rate.

56. A copy of the said list, as finally corrected, shall be given to the Patal, or other officer empowered under section fifty-seven to collect the said rate, and shall be his warrant to collect the rate from the persons named therein.

Recovery of Water Rates and other Dues in arrears.

Water-rates when and to whom to be paid.

57. Every water-rate leviable under this Act shall be payable in such instalments and on such dates and to such officers as shall from time to time be determined under the orders of the Governor in Council.

Arrears to be recoverable as land-revenue.

Any such rate, or instalments of the same, which is not paid on the day when it becomes due, and any sum due to Government or to a canal officer, whether on behalf of Government or of any other person, under Part III of this Act, which is not paid when demanded, shall be recoverable according to the law and under the rules for the time being in force for the recovery of arrears of land revenue.

Rent due to owners of water-courses to be recoverable as arrears of land-revenue.

Rent payable to the owner of a water-course by a person authorized to use such water-course shall be payable in such instalments and on such dates as the canal officer duly empowered to act under section twenty-three shall direct, and may be recovered on behalf of the owner according to the law and rules aforesaid: Provided always that no more shall at any time be payable to the owner than is actually recovered form the said person.

PART VII.

Of obtaining Labour for the Canals on emergencies.

Procedure for obtaining labour for works or repairs urgently required.

58. Whenever it appears to a Canal Officer duly empowered to act under this section, that unless some work or repair is immediately executed, such serious damage will happen to any canal as to cause sudden and extensive public injury,

or, that unless some clearance of a canal or other work which is necessary in order to maintain the established course of irrigation is immediately executed, serious public loss will occur,

and that the labourers necessary for the proper execution of such repair, clearance, or work cannot be obtained in the ordinary manner within the time that can be allowed for the execution of the same so as to prevent such injury or loss,

the said officer may, by order under his hand, direct that the provisions of this section shall be put into operation for the execution of such repair, clearance, or work; and thereupon every able-bodied person who resides or holds land in the vicinity of the locality where such repair, clearance, or work has to be executed, and whose name appears in the list hereinafter mentioned, shall if required to do so by such officer or by any person authorized by him in this behalf, be bound to assist in the execution of such repair, clearance or work by labouring thereat as such officer or any person authorized by him in this behalf may direct.

All persons so labouring shall be entitled to payment at rates which shall not be less than the highest rates for the time being paid in the neighbourhood for similar labour.

List of labourers.

59. Subject to such rules as may from time to time be prescribed under section seventy in this behalf, the Collector shall prepare a list of the persons liable to be required to assist as aforesaid, and may from time to time add to or alter such list or any part thereof.

Reports to be made by Canal Officer.

60. All orders made under section fifty-eight shall be immediately reported to the Collector for information of the Commissioner of the division, and likewise to the Chief Engineer for Irrigation for the information of Government.

PART VIII.

Of Penalties.

For damaging canal, &c.

61. Whoever voluntarily and without proper authority,

(1)—damages, alters, enlarges or obstructs any canal;

(2)—interferes with, or increases or diminishes the supply of water in, or the flow of water from, through, over, or under any canal, or by any means raises or lowers the level of the water in any canal;

(3)—corrupts or fouls the water of any canal so as to render it less fit for the purposes for which it is ordinarily used;

(4)—destroys, defaces or moves any land or mark or water-gauge fixed by the authority of a public servant;

(5)—destroys, tampers with, or removes, any apparatus, or part of any apparatus, for controlling, regulating, or measuring the flow of water in any canal;

(6)—passes, or causes animals or vehicles to pass in or across any of the works, banks, or channels of canal contrary to rules made under section seventy after he has been desired to desist therefrom;

(7)—causes or knowingly and wilfully permits cattle to graze upon any canal or flood-embankment, or tethers, or causes, or knowingly and wilfully permits cattle to be tethered upon any such canal or embankment, or roots up any grass, or other vegetation growing on any such canal or embankment, or removes, cuts or in any way injures or causes to be removed, cut, or otherwise injured any tree, bush, grass, or hedge intended for the protection of such canal or embankment;

(8)—neglects, without reasonable cause, to assist or to continue to assist in the execution of any repair, clearance, or work, when lawfully bound so to do under section fifty-eight;

(9)—violates any rule made under section seventy for breach whereof the Governor in Council shall, in such rules, direct that a penalty may be incurred;

and whoever—

(10)—being responsible for the maintenance of a water-course, or using a water-course, neglects to take proper precautions for the prevention of waste of the water thereof, or interferes with the authorized distribution of the water therefrom, or uses such water in an unauthorized manner, or prevents or interferes with the lawful use of such water-course by any person authorized to use the same or declared to be a joint owner thereof under section twenty-three;

shall, when such act shall not amount to the offence of committing mischief within the meaning of the Indian Penal Code, on conviction

before a Magistrate, be punished for each such offence with fine which may extend to fifty rupees, or with imprisonment of either description within the meaning of the said Code, for a term which may extend to one month, or with both.

For endangering stability of a canal, &c.

62. Whoever without proper authority,

(1)—pierces or cut through, or attempts to pierce or cut through, or otherwise to damage, destroy, or endanger the stability of any canal;

(2)—opens, shuts or obstructs, or attempts to open, shut or obstruct any sluice in any canal;

(3)—makes any dam or obstruction for the purpose of diverting or opposing the current of a river, or canal on the bank whereof there is a flood-embankment, or refuses or neglects to remove any such dam or obstruction when lawfully required so to do;

shall, when such act shall not amount to the offence of committing mischief within the meaning of the Indian Penal Code, on conviction before a Magistrate of the First or Second Class, be punished for each such offence with fine which may extend to two hundred rupees, or with imprisonment of either description within the meaning of the said Code, for a term which may extend to six months, or with both.

Obstruction to be removed and damage repaired.

63. Whenever any person is convicted under either of the last two preceding sections, the convicting Magistrate may order that he shall remove the obstruction, or repair the damage in respect of which the conviction is held within a period to be fixed in such order. If such person neglects or refuses to obey such order within the period so fixed, any Canal Officer duly empowered in this behalf may remove such obstruction, or repair such damage, and the cost of such removal or repair, as certified by the said officer, shall be leviable from such person by the Collector as an arrear of land-revenue.

Persons employed on canal may take offenders into custody.

64. Any person in charge of, or employed on any canal, may remove from the lands or buildings belonging thereto, or may take into custody without a warrant and take forthwith before a Magistrate or to the nearest Police Station, to be dealt with according to law, any person who within his view—

(1)—wilfully damages, obstructs, or fouls any canal, or

(2)—without proper authority interferes with the supply or flow of water, in or from any canal, or in any river cr stream, so as to endanger, damage, make dangerous or render less useful any canal.

Saving of prosecution under other laws.

65. Nothing herein contained shall prevent any person from being prosecuted under any other law for any act or omission made punishable by this Act: provided that no person shall be punished twice in respect of one and the same act or omission.

Payment of fine as awarded to informant.

66. Whenever any person is fined for an offence under this Act, the Court, which imposes such fine, or which confirms in appeal or revision a sentence of which such fine forms part, may direct that the whole or any part of such fine may be paid by way of award to any person who gave information leading to the detection of such offence or to the conviction of the offender.

If the fine be awarded by a Court whose decision is subject to appeal or revision, the amount awarded shall not be paid until the period prescribed for presentation of the appeal has elapsed, or, if an appeal be presented, till after the decision of the appeal.

PART IX.

MISCELLANEOUS.

Appeals against orders under this Act.

67. Every order passed by a canal officer under sections thirteen, eighteen, twenty-five, thirty, forty-five, forty-six and forty-eight, shall be appealable to the Collector, provided that the appeal be presented within thirty days of the date on which the order appealed against was communicated to the appellant.

All orders and proceedings of a Collector under this Act shall be subject to the supervision and control of the Commissioner of the division.

Power to summon and examine witnesses.

68. Any officer empowered under this Act to conduct any enquiry, may exercise all such powers connected with the summoning and examining of witnesses and the production of documents as are conferred on Civil Courts by the Code of Civil Procedure; and every such enquiry shall be deemed a judicial proceeding.

Service of notices.

69. Service of any notice under this Act shall be made by delivering or tendering a copy thereof signed by the officer therein mentioned. Whenever it may be practicable the service of the notice shall be made on the person therein named. When such person cannot be found, the service may be made on any adult male member of his family residing with him; and if no such adult male member can be found, the notice may be served by fixing the copy on the outer door of the house in which the person therein named ordinarily dwells or carries on business; and if such person has no ordinary place of residence within the district, service of any notice may be made by sending copy of such notice by post in a registered cover addressed to such person at his usual place of residence.

Power to make, alter, and cancel rules.

70. The Governor in Council may from time to time make rules not inconsistent with this Act to regulate the following matters:—

(*a*) the proceedings of any officer who, under any provision of this Act, is required or empowered to take action in any matter;

(*b*) the cases in which, the officers to whom, and the conditions subject to which, orders and decisions given under any provision of this Act, and not expressly provided for as regards appeal, shall be appealable;

(*c*) the person by whom, the time place, or manner at or in which, anything for the doing of which provision is made in this Act, shall be done;

(*d*) the amount of any charge to be made under this Act,

(*e*) and generally to carry out the provisions of this Act.

The Governor in Council may from time to time, alter or cancel any rules so made.

Publication of Rules.

Such rules, alterations, and cancelments shall be published in the *Bombay Government Gazette*, and shall thereupon have the force of law.

Saving of Municipal water-works.

71. Nothing in this Act shall be deemed to apply to any canal, channel, reservoir, lake, or other collection of water vesting in any municipality.

By order of His Excellency the Honourable the Governor in Council,

C. G. W. MACPHERSON,

Acting Under Secretary to Government.

Poona, 30th September 1879.

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